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ABSTRACT

Intended to provide an overview of ecological planning for educators and other interested citizens, this sourcebook outlines efforts to preserve agricultural land in Whitman County, Washington. How Whitman County established its agricultural lands policy is described, followed by an explanation of the land classification procedure. Also presented are strategies that were employed to organize affected communities around this issue. Finally, available alternatives for policy implementation are discussed in terms of their applicability to the Whitman County situation. Included in the appendix are an annotated bibliography and glossary of ecological planning terms. Numerous planning maps, diagrams and tables illustrate this publication. (WB)

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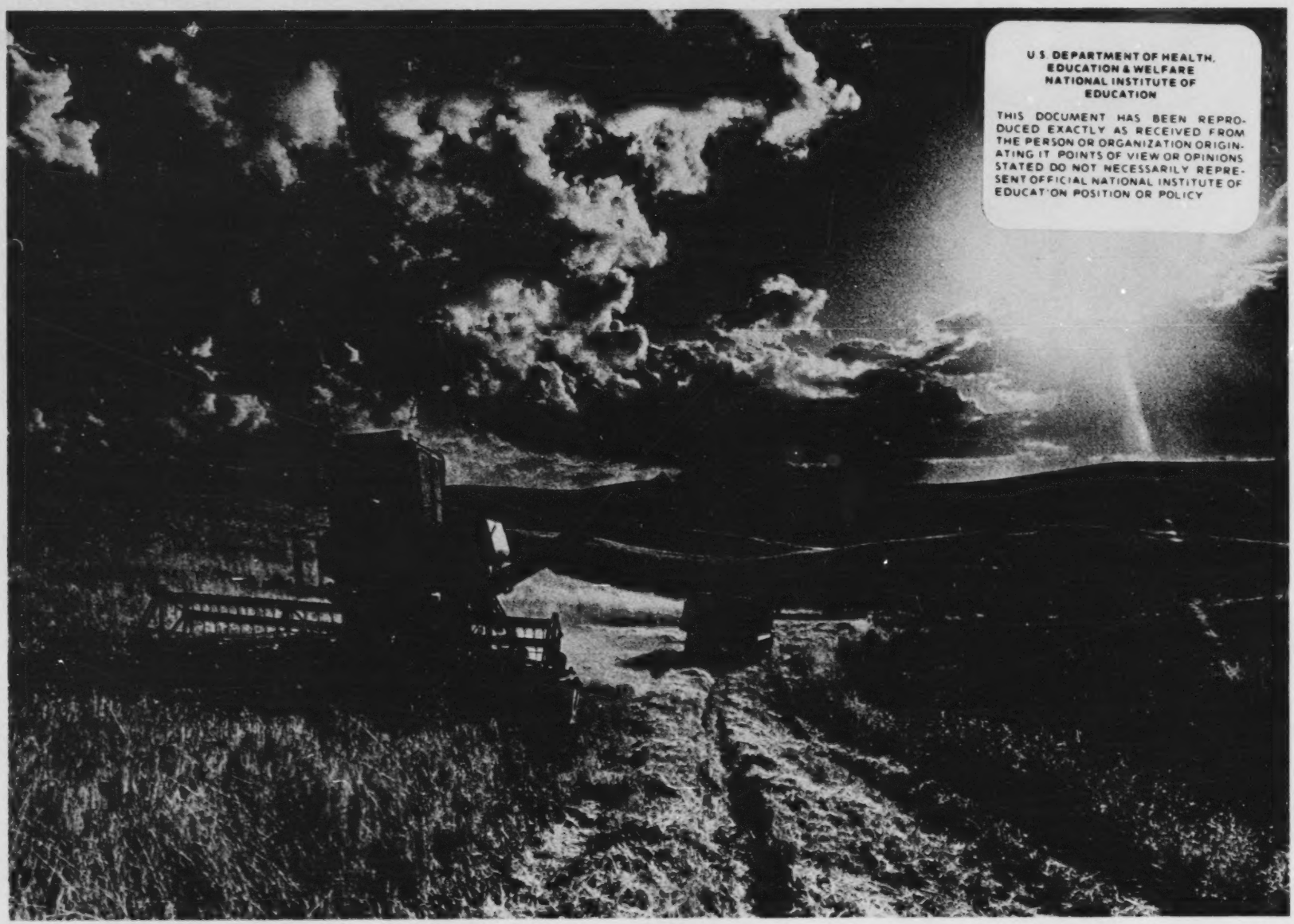

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ECOLOGICAL PLANNING FOR FARMLANDS PRESERVATION:

A Sourcebook for Educators and Planners

FREDERICK STEINER

SE 034 394

This sourcebook is dedicated to Harry Wegner whose foresight and leadership were responsible for Whitman County's farmland preservation efforts.

December 1980

Washington State University Cooperative Extension is working with the WSU Department of Horticulture and Landscape Architecture and Whitman County Regional Planning Council in the distribution of this sourcebook.

Nothing would distinguish the principles of man's relationship to environment from those of other species, were it not for the fact of his own evolution. Man, a powerful agent of change in space, himself undergoes change in time. This fact transforms his role in any natural community into a dynamic, unstable and often contradictory relationship unique among species: dynamic in space—the give-and-take relationship with the earth and its life—and dynamic in time—the recurrent change, destruction, and renewal of such give-and-take relationships in reference to new situations.

Artur Glikson
The Ecological Basis of Planning

ECOLOGICAL PLANNING FOR FARMLANDS PRESERVATION:

A Sourcebook for Educators and Planners

Frederick Steiner

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PREFACE

The Palouse Country of eastern Washington and northern Idaho existed long before the wheat farmers who currently till the land. Those farmers and their homesteading forebearers worked the land long before professional planners arrived in the area. The Palouse and its people both will be there long after the planners leave. So, it is the people of the Palouse who hold the key to the future of their land. This is an account of how the people of the Palouse approached the preservation of their land for agricultural use.

This account should prove helpful to others who face similar land-use issues. The Far West Laboratory has noted in its description of urban and rural planning for educators that "it is useful to describe planning as an activity centrally concerned with the linkage between knowledge and action" (Banathy et al., no date, p. 57). This sourcebook seeks to show the knowledge necessary for action and then suggest how action may be taken.

Ecology is central to this sourcebook because as a science and as an ethic, it seeks to show the interrelationships between living things and their environments. Ecological planning then seeks to use that knowledge for action. This understanding of living things and their environments is especially crucial among farmers because of their dependence on natural cycles. In the words of the wheat farmer and rancher turned planning commissioner, Norm Hatley, "farmers were the first ecologists."

Ian McHarg, the noted landscape architect and regional planner, coined the term "ecological planning." He and his colleagues at the University of Pennsylvania were primarily responsible for developing ecological planning as an approach to community, regional and resource planning. McHarg, however, was not alone in developing an ecological ethic for planning. Others who have made invaluable contributions include the wildlife biologist Aldo Leopold, Canadian forester G. Angus Hills, Israeli planner Artur Glikson, and landscape architect Phillip Lewis. Soil scientists, limnologists, anthropologists, lawyers and others have also helped to develop an ecological approach to planning.

As ecology evolved from an obscure branch of biology to a household word, it became burdened with misunderstandings. When the environmental movement of the late sixties and early seventies influenced academic institutions, many departments and programs added the prefix "environmental" to their course and program names. But very little real change occurred in the course content. I once spoke with a management professor who was given the charge of teaching an ecology course at a small Idaho community college.

"The administration wanted me to show both sides of ecology," he said, admitting he was ill-prepared to teach the subject.

"Oh," I responded , wondering to what two sides he was referring "so then you discussed the difference between the discrete and continuum views of plant communities?"[1]

"No, they wanted me to show the difference between the business and industry view of ecology and the Sierra Club's."[2]

This serious misunderstanding of the basic meaning of the word ecology is widespread. And this confusion extends into the arena of design and planning. Ian McHarg tells about being chosen with a prominent architect to find a 250-acre site for a "Temple of Science." By the time McHarg had picked out the site, the architect had already designed the building without the faintest concern for its environmental relationship.

It is important to understand the meaning of ecology: the relationship of living things to one another and to their physical and biological environment. Equally important, ecology's scientific heritage needs to be recognized. Also, it should be mentioned, that there are some ecologists who are less than enthusiastic about the broader applications of their science. Other ecologists, however, have been outspoken advocates of the use of ecological principles to solve environmental problems. Eugene Odum, for instance, has been a leader in both the science of ecology and its broader applications.

Though there are not two sides of ecology, there are various views concerning the gravity of the pending ecological crisis. William Ophuls, in his book *Ecology and the Politics of Scarcity* (1977), illustrates how eventually one view of this crisis will prevail. By addressing the preservation of agricultural land, the position is taken that productive land like energy, water and air is a resource with limits. Ophuls outlined the basis for this issue:

> *"The fundamental fact about agriculture is that it requires land, and good agricultural land is in fixed supply. Even in the United States, virtually all good agricultural land is already in use, it is this good land that provides us with almost all our food" (1977, pp. 50-51).*

This sourcebook is intended to provide educators and others with a clearer understanding of ecological planning. How the policy to preserve agricultural land in Whitman County, Washington was established is outlined. This is followed by an explanation of land classification using the ecological planning method. The method is explained,

[1]Ecologists have traditionally held two views of plant communities: discrete and continuum. The discrete view holds that communities exist in discontinuity (Daubenmire 1966). The continuum view holds that communities exist in continuity (McIntosh 1967). It is apparent to many ecologists that under some conditions vegetation forms a continuum, under other conditions it forms discrete communities, and that most vegetation is somewhere between (Beals 1969).

[2]Wherever a quotation appears in this text without being cited to a published source, it was taken from a personal interview or conversation.

a sample inventory, analysis and synthesis is reviewed, and how the method was used for agricultural preservation follows. How the community was organized around this issue is next reviewed. What alternatives are available for implementation are discussed and which have been or may be used in Whitman County are explained. Finally, there is a glossary and bibliography.

The policy to preserve agricultural land in Whitman County was established in the process of revising its comprehensive plan. This is an interesting story in itself. The staff planners of the Whitman County Regional Planning Council worked many long and hard hours with the people of the region to establish this goal.

The outline of the ecological planning method is a slightly revised version of a circular I wrote with my good friend and colleague, Ken Brooks, for the Washington State Cooperative Extension Service. The circular was titled "Ecological Planning Information" (Steiner and Brooks 1978).

The inventory and analysis information was generated by my classes in regional planning and landscape architecture. I learned this process from a most diligent and committed individual, Jon Berger, at the University of Pennsylvania. He with McHarg and several others, are responsible for finely tuning the method for classroom use at Pennsylvania and its adaptation at other institutions such as the University of Massachusetts, North Carolina State, University of Illinois, Iowa State, Utah State and Washington State. I am grateful to Ian McHarg, Jon Berger and Art Johnson for their advice concerning this section.

The use of this method for agricultural land preservation is a result of a United States Department of Health, Education and Welfare Environmental Education grant, "Ecological Planning for Agricultural Preservation, A Demonstration Project." I was the project director and am indebted to a multitude of individuals for its success. It was Bill Wagner, the innovative executive director of the Whitman County Regional Planning Council, who first suggested we apply for the grant. The Whitman County Commissioners and Planning Commission have been leaders in the area of agricultural preservation, and were most supportive. Jim Henning, Norm Hatley, John Henley, Jr., and especially the late Harry Wegner should be mentioned in this regard. I am indebted to Walter Bogan and Julia Lescuex of the Office of Environmental Education for their support. The individuals from the community and Washington State University who served on the Agricultural Preservation Technical Advisory Committee provided invaluable input. The Whitman County Soil Conservation Service was an irreplaceable resource, as were state-and federal-level U.S. Department of Agriculture officials.

My graduate assistant John Theilacker did all the thankless jobs such as arranging for coffee at meetings and tracing soil survey maps, and without him I would have an ulcer and grayer hair. The Department of Horticulture and Landscape Architecture and the Word Processing Center of the College of Agriculture at Washington State University always provided more in terms of photocopying and typing than was asked. Here Ernie Smith, Betty Musick, Janet Hinde and Doug Phillips are to be thanked. The Whitman County Regional Planning Council staff was always supportive. Lonnie Kennedy and Julie Knowles coordinated the graphics for this demonstration project and their fine work is evident. Lonnie Kennedy also designed and supervised the production of this publication. Molly Bolin Dight contributed as a summer landscape architecture intern. Mary Berkeley assisted with the proofreading.

The community organization and implementation sections are also results of the Environmental Education grant. Several established methods for community organization were used here, such as the formation of a technical advisory committee and good press relations. A novel approach was added—a television documentary involving farmers in the production. The alternatives for implementation section includes the various planning tools available for agricultural land preservation. Here I am indebted to the people in the various regions for their innovations.

For the glossary, I borrowed from everywhere. The bulk of the bibliography was adapted from one which was compiled and annotated by myself, Ken Brooks, and Rich Beach as part of a "mini-grant" provided by the Research and Arts Committee of Washington State University. This bibliography was published by Vance Bibliographies (Beach, Steiner and Brooks 1979). Rich Beach shouldered most of the responsibility for this bibliography. Additional bibliographic information concerning agricultural preservation was compiled by John Theilacker and myself. In addition to all of the above individuals, my colleagues and former students at Washington State University have made many valuable contributions which I have used.

This sourcebook is intended to be just that, a sourcebook. It is to be an introduction or a resource for planning and is by no means a complete text. Any mistakes which have been included are my fault. It is my hope there are few. I hope this document may prove helpful in gaining a better understanding of each other and of the world in which we live. This understanding can be used to help us look at the alternatives available for the difficult decisions we must make concerning our future.

INTRODUCTION

The Council on Environmental Quality found in its eighth annual report that more than 8 million acres of prime United States farmland were converted (often with federal assistance) to urban development, reservoirs, highways, recreation, surface mining and other uses from 1967 to 1975 — an average of 1 million acres per year. More recent estimates place this figure as high as 3 million acres of farmland lost annually. Though new lands are added to production, and advanced technology has increased the yield per acre of many commodities, the economic, environmental and social costs are staggering. Economically, farmers are dependent on each other's existence to support their service and marketing systems. As some farmers are displaced by other land uses, the support dwindles until the systems collapse, often forcing the remaining farmers to also move on.

Environmental costs are inevitable with changing farmland to other uses. The change is so disruptive to the existing habitat that a complete replacement of animals, insects and vegetation results. Additionally, in many areas of the American West, agriculture competes with other land uses for water. Energy consumption also dramatically increases when new soils are brought into production, and energy costs for transportation to and from remote areas cause dollar costs to rise.

Social costs associated with the removal of existing farmland involve family and town dislocation. Farm families and those dependent upon the farmer for their livelihood (seed and farm implement suppliers, cooperative workers, research scientists) all will be dislocated as the farms are forced to make way for other land uses. Some towns die, others will grow but be radically changed. Whichever occurs, the social structure will be very much different than it was, and this difference will manifest itself in lifestyle changes. Ian McHarg has summarized this problem saying, "the replacement of agriculture by suburbanization and non-farm rural residential housing is more than a loss of a serene pastoral landscape, it is immutable loss of scarce resources."

Good agricultural land takes millions of years to develop and depends on the right, lucky combination of the soil forming processes of geologic parent material, climate and biotic formation. The loss of this precious resource seems especially tragic in light of both the international hunger crisis and the current domestic economic plight. Wendell Fletcher, formerly an analyst for the Congressional Research Service and now on the staff of the American Land Forum, has observed:

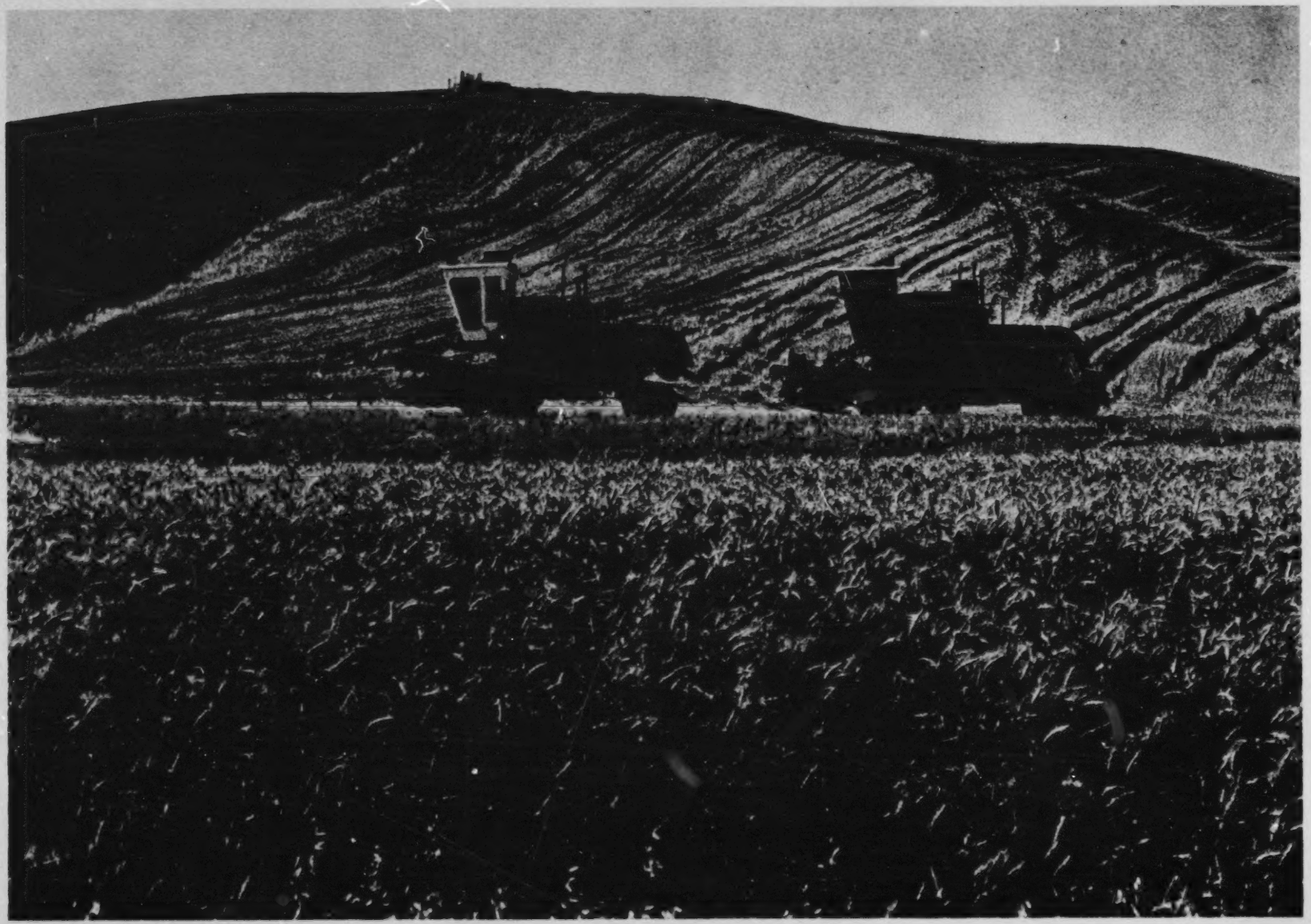
> *"From the policy makers' perspective, export demand for American food products—and the etxent to which the United States wishes to respond to that demand in order to meet humanitarian, diplomatic and economic objectives—is likely to remain a central factor in determining whether our cropland base will need to be kept at present high levels or even expand in the future." (Fletcher 1978, p. 22)*

This concern about the loss of farmland has prompted scattered federal, state and local action. Federal concern has been expressed in both the legislative and executive branches of government. In the 95th and 96th Congresses, Washington Senator Warren Magnuson introduced the National Agricultural Land Policy Act, and Vermont Representative James Jeffords presented a similar bill in the House. Though neither measure has yet passed, both are indicative of the increased interest in the issue of farmlands protection.

Several federal agencies including the Department of Agriculture, the Council on Environmental Quality and the Environmental Protection Agency, have issued policy statements related to agricultural lands. These policies are intended to focus greater attention on federal projects and activities that may unintentionally encourage the indiscriminate development of farmland. Additionally, an interagency task force has been organized to conduct a national agricultural land study to research the issue further. The results of this study will be available in 1981.

Many states also have taken action to protect farmlands. Hawaii has the most aggressive program, but in the 50th state, land is more obviously a scarce resource. Other states with various farmlands preservation policies include Oregon, Wisconsin, New York, New Jersey, Massachusetts, Maryland, Vermont, California and Pennsylvania. At this time, it appears the programs of Oregon and Wisconsin have been the most successful, but, as the farmlands issue becomes more important, other state programs may become more effective. Certainly there is room for innovation and new ideas.

On the local level, a strong rationale for protecting farmlands is based on sound regional land-use planning which has historically sought to control "sprawl development" and its associated economic, social and environmental costs. Whitman County, Washington, is one region which has addressed the issue of agricultural preservation locally. The effort of this county should prove helpful for other areas seeking to preserve its agricultural resources.



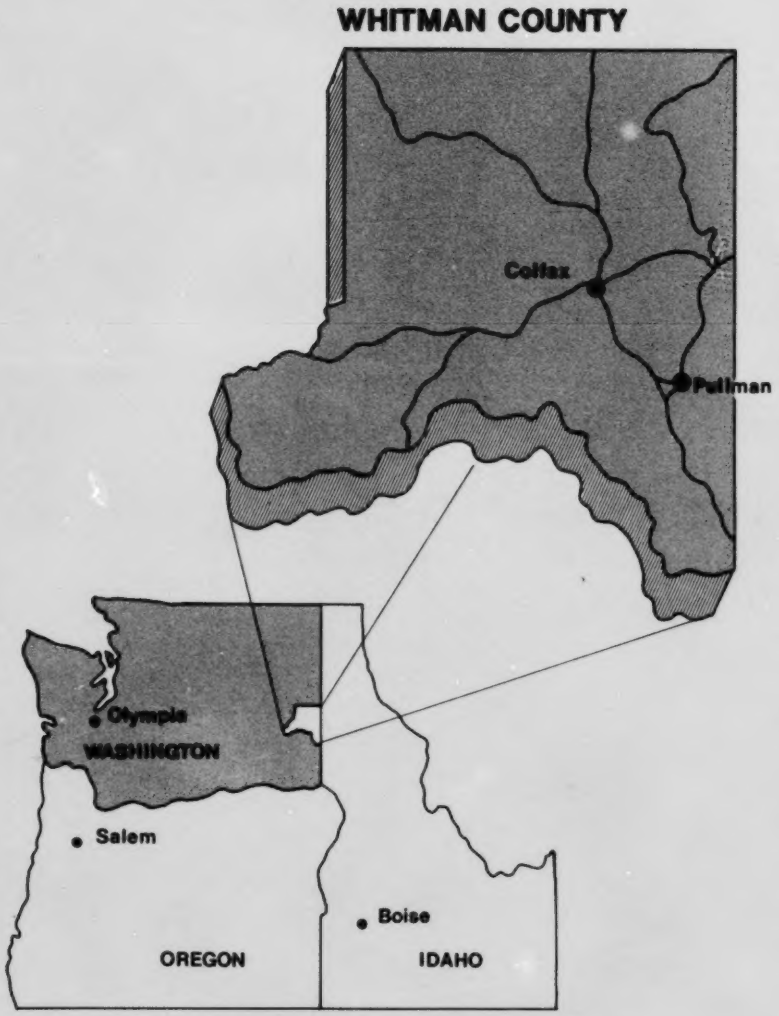


Figure 1 Regional Location of Whitman County, Washington

Whitman County lies in the southeastern corner of the state of Washington. Its eastern border is coterminous with the state of Idaho, while its southern border is 30 miles north of the state of Oregon (*Figure 1*). Like many western counties, it is larger than some eastern states. Whitman County, for example, is larger than the states of Delaware and Rhode Island and about half the size of New Jersey.

Peas, lentils, barley, mustard, grass seed and sunflowers are grown in Whitman County, but winter white wheat is the major crop. Wheat also ranks as the top cash crop in the state of Washington, and Washington ranks fifth in the nation as a wheat producer. Whitman County produces more bushels of wheat than any other county in the state or nation. Its soils have a higher yield of winter white wheat per acre than any other soil in the nation. Since the United States produces 14% of the wheat in the world, it is an understatement to say Whitman County wheat production is important to the national economy.

The wheat farmers of Whitman County are politically conservative like their counterparts in other agrarian regions. They are of German and Anglo heritage; many are Catholic and Lutheran, and most belong to the Republican party. The rural sociologists, Flinn and Johnson (1974), developed a belief structure which they felt characterizes the agrarian ideology. Agrarianism is, in general, a set of pro-rural, anti-urban sentiments which many farmers hold. The tenets of this belief structure are as follows:

1. Agriculture is the most basic occupation in our society and almost all other occupations depend on it.
2. A depression in agriculture is likely to cause a depression in the entire country.
3. Farming involves understanding and working with nature, therefore, it is a more natural occupation than others.
4. One reason why we hear so much about crime and corruption is because our nation is so urbanized.
5. Farming should be an occupation where farmers are completely independent with respect to economic decisions.
6. A farmer should be proud to say he owes money to no one.
7. Farmers ought to appreciate farming as a way of life and be less concerned with their cash income.
8. Farmers should raise all the crops and livestock possible as long as there are hungry people.
9. Lawlessness and lack of authority are major problems in the United States today.
10. The replacement of family farms by large-scale farms using hired labor would have undesirable consequences for the nation.
11. If the economic situation continues like it is now, in a few years family farms will be replaced by corporate farms (Flinn and Johnson 1974).

Researchers in Whitman County (Clark 1979) have found that a majority of farmers they surveyed agreed with all but number 7—the question of concern with cash income. These basic agrarian beliefs are mentioned because it is believed that farmers with their conservative, independent nature, oppose all forms of planning, especially that planning which deals with land use. Lassey (1978) traces this opposition to the fact that most professional planners have an urban bias and farmers have strong anti-urban sentiment. Urban planners use tools designed for the cities and suburbs.

In Whitman County, the farmers remain anti-state and federal planning, but they are pro-local county and regional planning. Why? One reason may be the efforts and initiative of the late Harry Wegner, who was himself a local farmer.

Harry Wegner, who was almost 60 years old when he died in December, 1979, lived in the Palouse all his adult life, actively involved in farming for over forty years. His family moved to Whitman County from nearby Kendrick, Idaho, in 1937. Like many of the other wheat farmers in the area, Wegner's family is of German origin. His wife, Etta Wayman, is also of German ancestry and was born in Whitman County. In fact, the Wayman farmstead is only a mile and a half down the road from the Wegner home.

A tall and amiable man, Wegner's political involvement began in 1958 when he ran for the City of Pullman School Board. Pullman, the major city in Whitman County, is the location of Washington State University and is responsible for the growth pressure in the county. After serving eleven years on the School Board, Harry was elected to the County Commission in 1968. As county commissioner, he began his involvement with land-use planning.

Like the other farmers of the area, Harry Wegner was conservative politically; a Republican. Nevertheless, the issues facing the county at the time convinced him that planning was a necessity. The late sixties was a period of skyrocketing growth at Washington State University and the University of Idaho in nearby Moscow. These two land-grant universities are only eight miles apart, though in different states.

With the county's first full-time planner, José Urcia, Whitman County began its planning efforts. From the beginning, the approaches taken were novel in many regards. The enabling legislation for regional planning in Washington State allows a single county to establish a regional council within its own boundaries. The Whitman County Regional Planning Council was comprised of the county, Washington State University, Pullman, ten smaller towns, and the Port of Whitman[3]. Associate members included the League of Women Voters, the Farm Bureau, the conservation districts and the Board of Realtors. The regional council's staff provides professional planning assistance to all the members, including the county.

In 1969, responding to rapid urbanization, a "transitional" zone was established in a forty-five square mile area around Pullman. In that zone, anyone could build a home on a one-acre tract. The result was the continued loss of farmland to scattered one-acre homesites concentrated in the Pullman area. Similar development was occurring across the state line in Latah County, Idaho.

Under the leadership of Wegner, in 1977 the transitional zone was rescinded. The reasons why the zone was rescinded included: agricultural land was being lost; the county was reluctant to provide city services in rural areas; and a Washington Supreme Court case (*Langan-vs. Valicopters, Inc.*) determined that an individual spraying pesticides is liable for damage on adjacent crops. Wheat farmers spraying pesticides were concerned that they would be liable for damage to suburban residents' gardens.

By this time, Bill Wagner had replaced Urcia as the executive director of the regional planning council. Bill Wagner had moved to Whitman County with his wife who was finishing her residency in veterinary medicine. A veteran of VISTA and the Peace Corps, Wagner had resigned a job with the California governor's Office of Planning and Research to move to Whitman County. Before applying for the director's position, Wagner drove a combine during wheat harvest, experience which impressed many of the area's farmers.

Besides Wegner and Wagner, another key individual in the county's evolving planning efforts was Norm Hatley, the chairman of the Whitman County Planning Commission. A colorful, outspoken wheat farmer and cattle rancher, Hatley has evolved from someone diametrically opposed to all forms of government intervention in private land to one of the area's strongest proponents of planning at the local level.

Once the zone was rescinded, the former transitional area was affected by the large-lot zoning policy and by a ban on subdivisions in unincorporated areas which was in effect for the rest of the county zoned agricultural. The elimination of subdivision development outside incorporated areas was a major planning accomplishment in itself. The large-lot zoning required any single-family house built in an agricultural area to be on a minimum of 20 acres. The county established this 20-acre minimum in 1974 after a long, bitter fight.

"I can remember five hundred angry people in the auditorium of the Colfax High School at one public hearing, and they didn't want anything to do with the 20-acre minimum," Harry Wegner recalled. "I can remember conducting meetings when we adopted it, our chambers were so full, nobody wanted the 20-acre minimum. We were

[3]With the damming of the Snake River by the U.S. Army Corps of Engineers, Whitman County became a potential world port and, as such, a Port District was organized.

probably unique in that we had some of the best farm land in the world—wheat ground that will raise up to a hundred bushels to the acre—and it doesn't raise a thing when there's a house on it."

So, by 1977, the county was predominantly zoned agricultural with a 20-acre minimum. Wegner and other county leaders felt that this was not enough, that even the 20-acre minimum was taking some of the best farmland out of production. It was decided that this issue would be addressed in the process of revising the county's comprehensive plan.

Support for local planning during this period grew largely as a result of actions taken by the U.S. Army Corps of Engineers. The Corps decided, after straightening the Snake River and making Lewiston, Idaho, a world port, to build a pumped storage unit. This pumped storage unit would hold excess water that could be used to recharge the Snake River in periods of low flow. Even though the backwater flooded many acres of fine orchard land, many of the farmers supported the damming of the Snake because of the access it provided for shipping wheat to world markets. But, the Corps planned the pumped storage unit to fill a valley of 10,000 acres of some of the best wheat land in the Palouse and were considering a second valley with equally good land. When news of the Corps' plans reached the public, widespread controversy arose. Nearly a thousand farmers crammed into one meeting and shouted down a dumbfounded army colonel. The end result was that the farmers concluded it was better for them to be involved in planning than for outside interests to come in and dictate what could be done with the land.

There was one additional influence which helped pave the way for regional planning in Whitman County, Harry Wegner's involvement with the ill-fated Washington State Land Use Commission between 1971 and 1973. This was a period when the Northwest was the vanguard of environmental planning under the leadership of Tom McCall in Oregon, Dan Evans in Washington, and Cecil Andrus in Idaho. Much innovative legislation was developed in these states including Oregon's Senate Bill 100. But, while Oregon moved towards state land-use planning, Washington faltered. Wegner had strong feelings about why this happened. Of the fifteen members of the Commission, he was the only rural representative, the only farmer and the only individual from county government. Most of the other members were representatives of business and industry or attorneys.

"I was sort of a voice in the wilderness," Wegner explained. "I was a little disillusioned with the planning that went on because it seemed the main thing that the Commission wanted was to develop a building permit system for the state."

For Wegner, it was an educational experience. He learned all the current techniques being discussed and tried in planning. This experience, with that of the other local citizens, was put to work in the process of revising the comprehensive plan. In September, 1977, an advisory committee for the revision was organized and work was begun. The plan revision consisted of three phases: 1) information gathering, 2) goal making, and 3) policy making (Whitman County Regional Planning Council 1978).

In the first phase, a series of nine background reports was prepared by the regional planning staff with some help from Washington State University student interns. These reports covered such factors as population, land and water resources, transportation, public facilities and services, conservation and natural hazards, economic trends, and housing. These reports were reviewed by responsible government officials and by citizens in public workshops. A detailed ecological inventory of the county was not completed at this time because of the significant commitment needed for such a task. Environmental data were especially lacking during this stage; even a standard Soil Conservation Service Soil Survey had not been completed. However, the completed technical reports were thorough on the information that was addressed and were of great assistance to the advisory committee.

In the second phase, goals were established. Washington State law requires that comprehensive plans include land-use and circulation goals. The advisory committee decided to address several additional issues including economic development, environmental quality and conservation, parks and recreation, and implementation.

In the final phase, the advisory committee and regional planning staff developed specific policies to achieve the goals established for the plan. These policies took two forms: planning guidelines and implementation guidelines. The final comprehensive plan, which was adopted by the Board of Commissioners on July 31, 1978, took the form of a policy document with action guidelines for implementation.

Those policies included in the plan's land-use element addressed agriculture, rural housing, suburban and urban housing, industry, commerce, public facilities and unincorporated rural communities. The policy which received top priority was agricultural land use. It became the county's top goal to:

> *"Preserve productive agricultural land and the family farm as the prime economic and social resources of Whitman County by preventing land from being taken out of production by indiscriminate or excessive changes in land use."* (Whitman County Regional Planning Council 1978, p. 25).

While the Whitman County comprehensive plan established the policy of preserving agricultural land and the family farm, the question remained—which lands should be preserved? This problem was compounded by another goal in the comprehensive plan which allowed for limited rural housing. The low-density rural housing provision was important because county officials realized that there was a need for this type of housing for farm families and workers and those who sought a rural living situation. While the plan outlined criteria for locating rural housing, a second question remained—was there land that met the criteria for rural housing, and if so, how much? Answers to these questions were arrived at with the help of the ecological planning method.

The Ecological Planning Method

What exactly is the ecological planning method? It is primarily a method of studying the biophysical and sociocultural systems of a region to reveal where a specific land use may best be practiced. McHarg said, "the method defines the best areas for a potential land use at the convergence of all or most of the factors deemed propitious for the use in the absence of all or most detrimental conditions. Areas meeting this standard are deemed intrinsically suitable for the land use under consideration."

The method involves a number of steps showing the transformation of data at each level, which are:

1. State the *objective* of the planning study—define the issue being addressed.
2. Ecological *inventory* of the region—define the parts of the system.
3. *Analysis* of the region—show how the parts work.
4. *Synthesis*—show the interactions between the parts in an ecological method.
5. *Alternatives*—present different organizations of the environment.
6. *Implementation*—present various strategies, tactics, and processes that could be used to realize a particular design or plan alternative.
7. *Evaluation*—a gauge of results of the plan over time from criteria elicited from the users (McHarg 1969; Berger, Johnson, Rose and Skaller 1977).

STATE THE OBJECTIVE

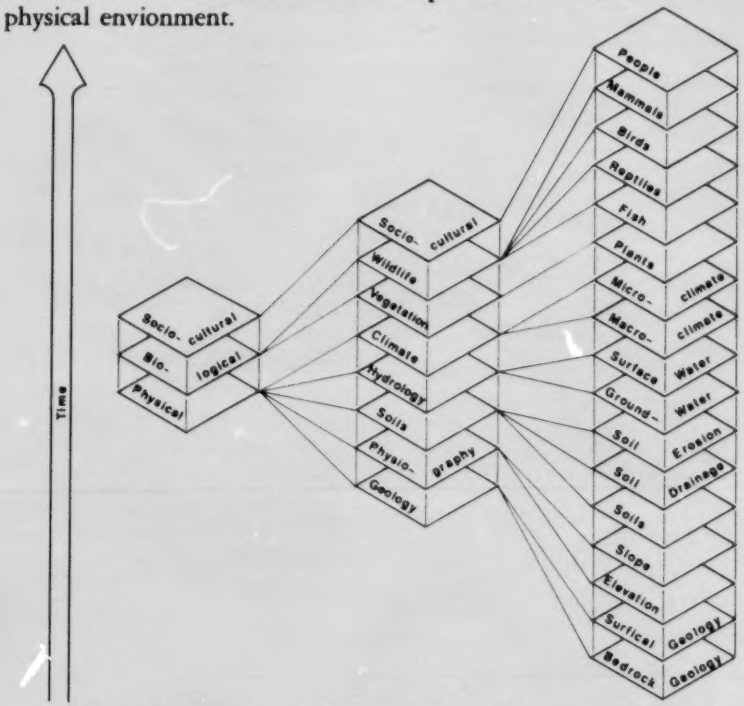
The first step involves the definition of the land-use issue being addressed. This should involve setting the limits and boundaries of the project. Issues may be identified in various ways at several levels of government. While many planning projects address a single issue, the relationship to other issues should not be ignored.

ECOLOGICAL INVENTORY

The next step involves the collection of regional data on the appropriate physical, biological and social factors that make up the region. This may be done by planners using available published and mapped data. Major tasks are the search, accumulation, field checking and mapping of data. McHarg observed that this step can be more effectively accomplished by the most knowledgeable scientists of the region representing an array of necessary disciplines. Thus, the inventory becomes an interdisciplinary collection process.

The layer-cake simulation model (*Figure 2*) provides the central group of biophysical elements for the inventory. Categories include geology, physiography, groundwater, surface water, soils, climate, vegetation and wildlife. The object of the study will determine which inventories are necessary.

The inventory of the sociocultural systems is accomplished by participant observation. Such categories as history, ethnology, political economy, settlement patterns, community power structure and legal structure are considered in relationship to each other and to the biophysical envionment.



ADAPTED FROM WALLACE, McHARG, ROBERTS, AND TODD 1971-1974.

Figure 2 Layer-Cake Simulation Model

ANALYSIS OF THE REGION

An analysis of a region defines its structure and function. A region is a constantly changing system. The phenomena identified in the ecological inventory are current aspects of dynamic processes. Once phenomena are located and described, they are capable of being examined against time, not only to explain the present, but to predict the future. This dynamism is of important consequence to people (Berger et al. 1977).

A useful guide is to identify bivariate relationships for all possible pairs of landscape elements. The following matrix is a convenient way to deal with these relationships (*Figure 3*). Relationships, both spatial and through process, exist between each numbered pair of elements. For instance, the geology of a region exerts a direct influence on its physiography (1). Through geologic time, the physical form of the landscape is developed. Likewise, the physiography influences microclimate (9). Rainfall and temperature vary from mountainous areas to valleys. Climate, in turn, affects potential habitats for plants and animals (19, 20) and so on. For each number on the chart, the indicated interaction may be described.

	GEOLOGY	PHYSIOGRAPHY	CLIMATE	SOILS	GROUNDWATER	SURFACE WATER	VEGETATION	WILDLIFE	LAND USE
GEOLOGY		1	2	3	4	5	6	7	8
PHYSIOGRAPHY			9	10	11	12	13	14	15
CLIMATE				16	17	18	19	20	21
SOILS					22	23	24	25	26
GROUNDWATER						27	28	29	30
SURFACE WATER							31	32	33
VEGETATION								34	35
WILDLIFE									36
LAND USE									

Figure 3 Bivarite Relationships

29

SYNTHESIS

The dictum of ecology is, "everything is connected to everything else." In that regard synthesis is an extension of the inventory and analysis processes; few are involved in showing the interrelationship among elements of the system.

One tool used by planners is the physical overlaying of mapping, while another is the two-dimensional matrix. Both allow comparisons of all single variables and explorations of many possible relationships. The idea is to develop patterns. Computer systems, such as IMGRID developed by Carl Steinitz and David Sinton at Harvard University, can be used in both the overlaying and matrixing processes (Steinetz et al. 1970; Sinton 1977). Computer systems allow multidimensional analyses. Other techniques such as graphic cross sections and block diagrams can express some interrelationships.

ALTERNATIVES

Inventory, analysis, and synthesis represent the data bank for ecological planning. It is important that these data be interpreted in order to provide alternative solutions to problems and issues facing the people of the region. These problems and issues can vary greatly from region to region based on needs and desires of the population.

The objective of this step is to reveal, first, the convergence of all or most of the factors deemed propitious for the land-use need with none or few constraining conditions and, second, the desires of the people in the region under study. It is a search procedure for the convergence of positive and negative factors of the biophysical and sociocultural environments.

One tool which has been developed to provide alternatives is the suitability method, which seeks to show what areas are intrinsically suitable for various land uses (*Figure 4*). Suitability maps are helpful tools for accomplishing many types of land-use planning. These maps show, in a gradient, the site analyzed with respect to a particular use. They can show the effect of the use in biophysical and sociocultural environments. Some types of land uses which can be planned for through suitability analyses include: housing, agriculture, recreation, forestry, commerce, industry and institutional uses.[4]

IMPLEMENTATION

What are the legal mechanisms needed to realize a particular alternative? The alternatives, in part or whole, can be implemented within

[4]For more information about suitability mapping, see the excellent article by Lewis Hopkins (1977), "Methods for Generating Land Suitability Maps: A Comparative Evaluation" which appeared in the *Journal of the American Institute of Planners*, Vol. 43, No. 4, pp. 386-400.

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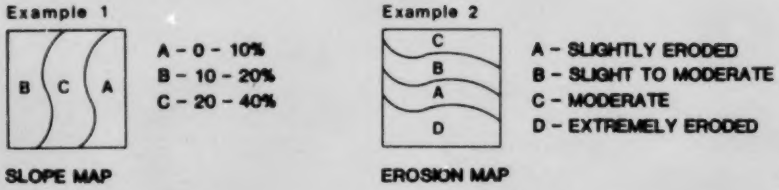
STEP 1
MAP DATA FACTORS BY TYPE

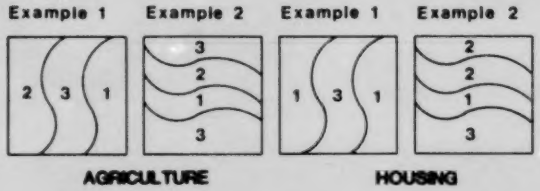


STEP 2
RATE EACH TYPE OF EACH FACTOR FOR EACH LAND USE

Factor Types	Agriculture	Housing
Example 1		
A	1	1
B	2	1
C	3	3
Example 2		
A	1	1
B	2	2
C	3	2
D	3	3

1 - PRIME SUITABILITY
2 - SECONDARY
3 - TERTIARY

STEP 3
MAP RATINGS FOR EACH AND USE ONE SET OF MAPS FOR EACH LAND USE



STEP 4
OVERLAY SINGLE FACTOR SUITABILITY MAPS TO OBTAIN COMPOSITES. ONE MAP FOR EACH LAND USE

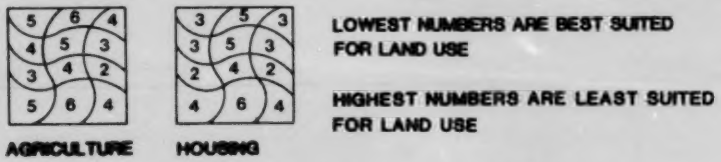


Figure 4 Suitability Ranking

the legal planning structure of many states. For instance, the optional conservation element of the comprehensive plan in the state of Washington's planning enabling legislation seems to beg for ecological planning. This element is for "the conservation, development and utilization of natural resources, including water and its hydraulic force, forests, water sheds, soils, rivers and other waters, harbors, fisheries, wildlife, minerals and other natural resources." Various other planning tools such as contract zoning, planned unit developments, performance standards, shoreline management, and floodplain zoning offer possibilities for implementation.

EVALUATION

Only time will tell if a plan is successful or not. The ultimate success or failure of the plan depends on the competence with which it was completed and on the commitment and involvement of those responsible for implementation. Through continuous re-evaluation and new information, new alternatives may be implemented to improve the plan.

Inventory Information

> *On earth the frontiers of science have pushed far into the secrets of nature. The frontiers of man have visited or settled every part of the globe. The new frontier, and the challenging explorations that manifest it, is the realization that man must become an integrative force on this planet or perish. In the new frontier, it will always be "survival of the fittest."*
>
> Wallace, McHarg, Roberts and Todd
> *The Ecological Plan for the Woodlands New Community*

There are many ways to solve a problem and to communicate its solution—graphically, orally, quantitatively or in prose. All of these ways are used by planners who use the best available scientific data to solve various issues facing communities. Using existing data and making it meaningful to those outside narrow scientific disciplines is not a simple task. Yet, that is the goal of ecological planning—to bridge the gaps between pieces of information so that the whole can be better understood.

This section will concentrate on the technique of displaying information graphically: maps, illustrations, matrices and charts. Graphic representations are used by planners in public presentations and in reports. They are one symbolic representation of the environment at a given point in time. Types of written technical reports are also suggested. For purposes of illustration, a site adjacent to the town of

Albion, Washington, will be used to display information. (Albion is located in a larger demonstration site which will be discussed later.)

The starting point for collecting information in a graphic format is the base map. The most convenient source for a base map is the United States Geological Survey (USGS) 7.5 minute quadrangle maps with a scale of 1:24000. USGS maps are available for most areas in the United States. They give the location of all buildings (except in urban areas), bodies of water, elevations, contour lines, roads, rail lines, political boundaries and some woodlands. A portion of a quadrangle map or several quadrangle maps mosaiced (pieced) together can be photographically reproduced on mylar. Additional information can be added to the mylar to form the base map. The most important information includes a north arrow, scale, a map title, a legend, the source of the information displayed, the name of the study site or region, and the group performing the planning project (*Figure 5*). In addition to the familiar 7.5 minute quadrangle maps, "ortho" aerial photographs at the same scale are now available from the USGS in many areas (*Figure 6*). These photographs are helpful both for performing inventories and displaying information.

Next it is important to place the area being studied in a regional context. This is important because people who read a planning report may often come from outside the area described. Often it is necessary to place the area in a subregional context, perhaps a county or other governmental jurisdiction, then in a larger regional context, such as the state or multistate region (*Figure 7*).

The information that follows includes the type of data that can be inventoried and analyzed for ecological planning. It is specific for Albion, so all of the potential information that may be covered is not included in the example. However, a summary of all the elements which may be included in an inventory follows each section. The characteristics of the region and the issues involved will determine what will be inventoried. Major sources of information are also included after each section.

Geology

The oldest component of any landscape is its geology. Located in the inland basin between the Cascade and Rocky Mountain Ranges, Albion is in the physiographic region commonly known as the Palouse. The unique dune-like topography of the Palouse is a result of wind-blown loess deposits which cover the area. Through the eolian (wind-blown) deposition and erosion by rain and run-off, the landscape has developed into a complex formation of small hills and valleys.

The geology map of Albion reveals that the area's geology is characterized by two types of subsurface and two types of surface formations. Crystalline granite rocks, which underlie the area, were formed about 70 million years ago. These protrude through the younger formations at a few high points throughout the region (*Figure 8*). Over the crystalline rocks are basalts. Better known as Yakima Basalts, they originated as subsurface lava flows during the Miocene and Pliocene periods. Largely as a result of erosion, they are exposed as outcrops at the surface in many locations, especially along streambanks and steep slopes. These subsurface basalts and granite are covered by eolian silts called loess. They were carried into the area from the Columbia River Basin by prevailing southwest winds. The resulting loess soils, known collectively as the Palouse formation, are fertile and support some of the nation's most productive dryland agriculture. Alluvial (water-borne) deposits are predominant along streams and valley bottoms. In some cases, they are merely relocated loess and, in other cases, they range from coarse sands to gravels and are principally basalt rubble (Walters and Glancy 1969; Nassar and Walters 1975).

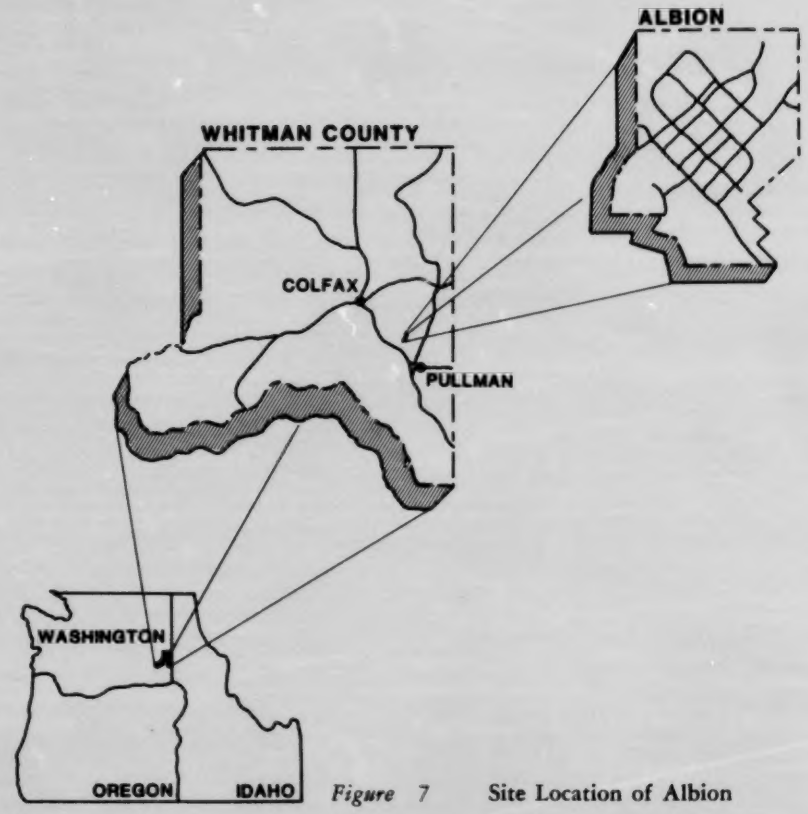


Figure 7 Site Location of Albion

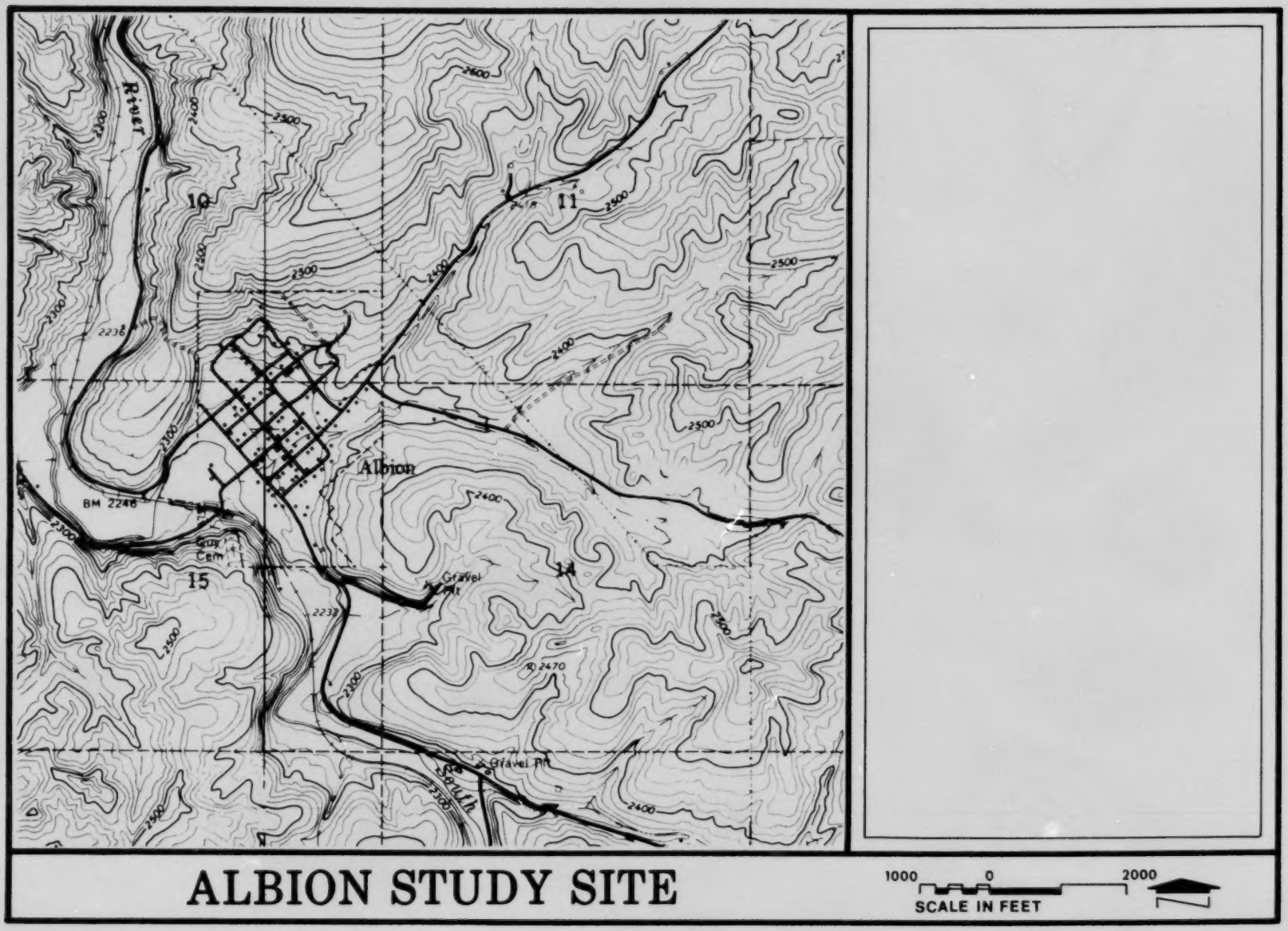


Figure 5 Albion, Washington, Base Map

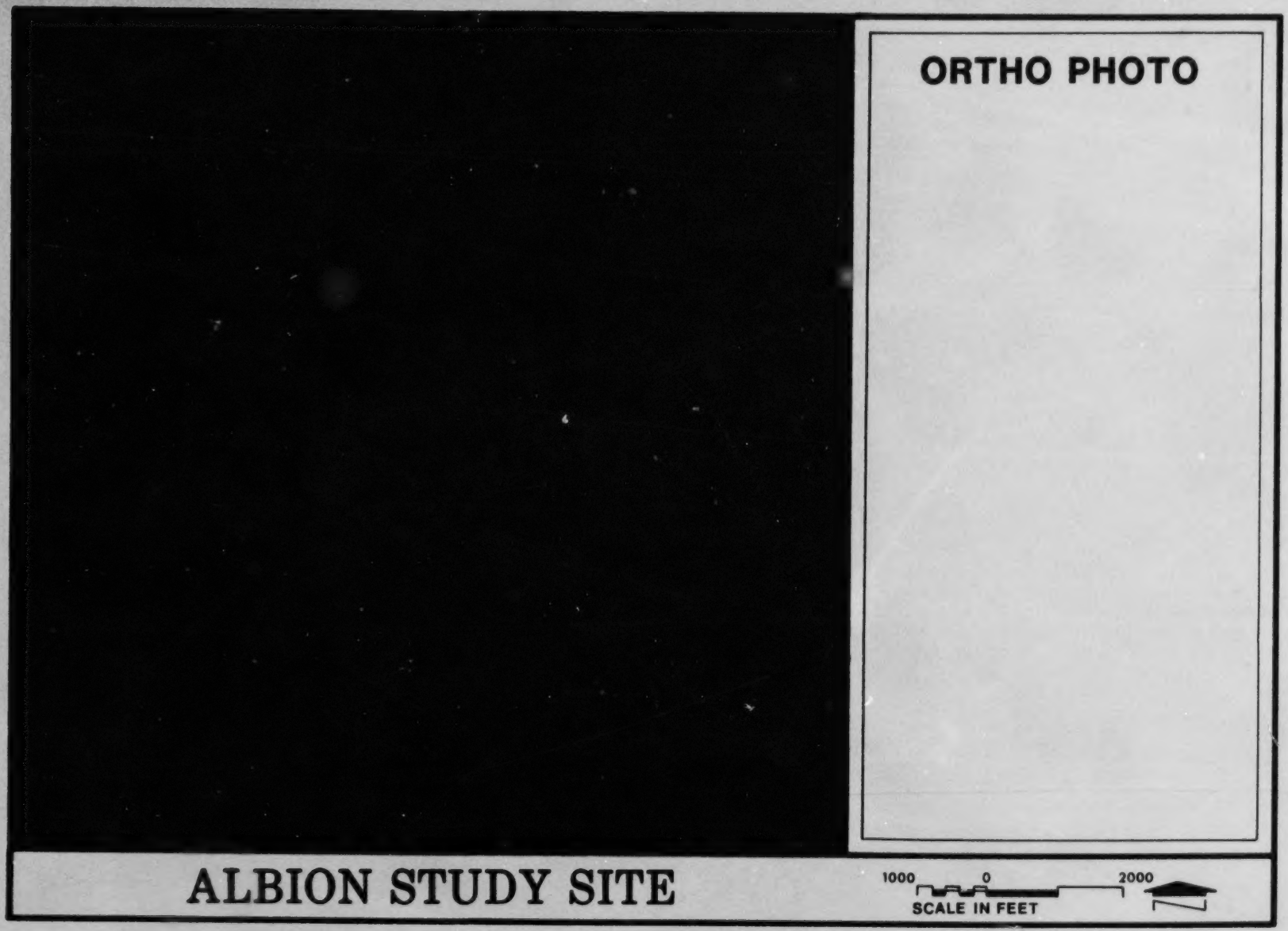


Figure 6 Ortho Photograph of Albion Area

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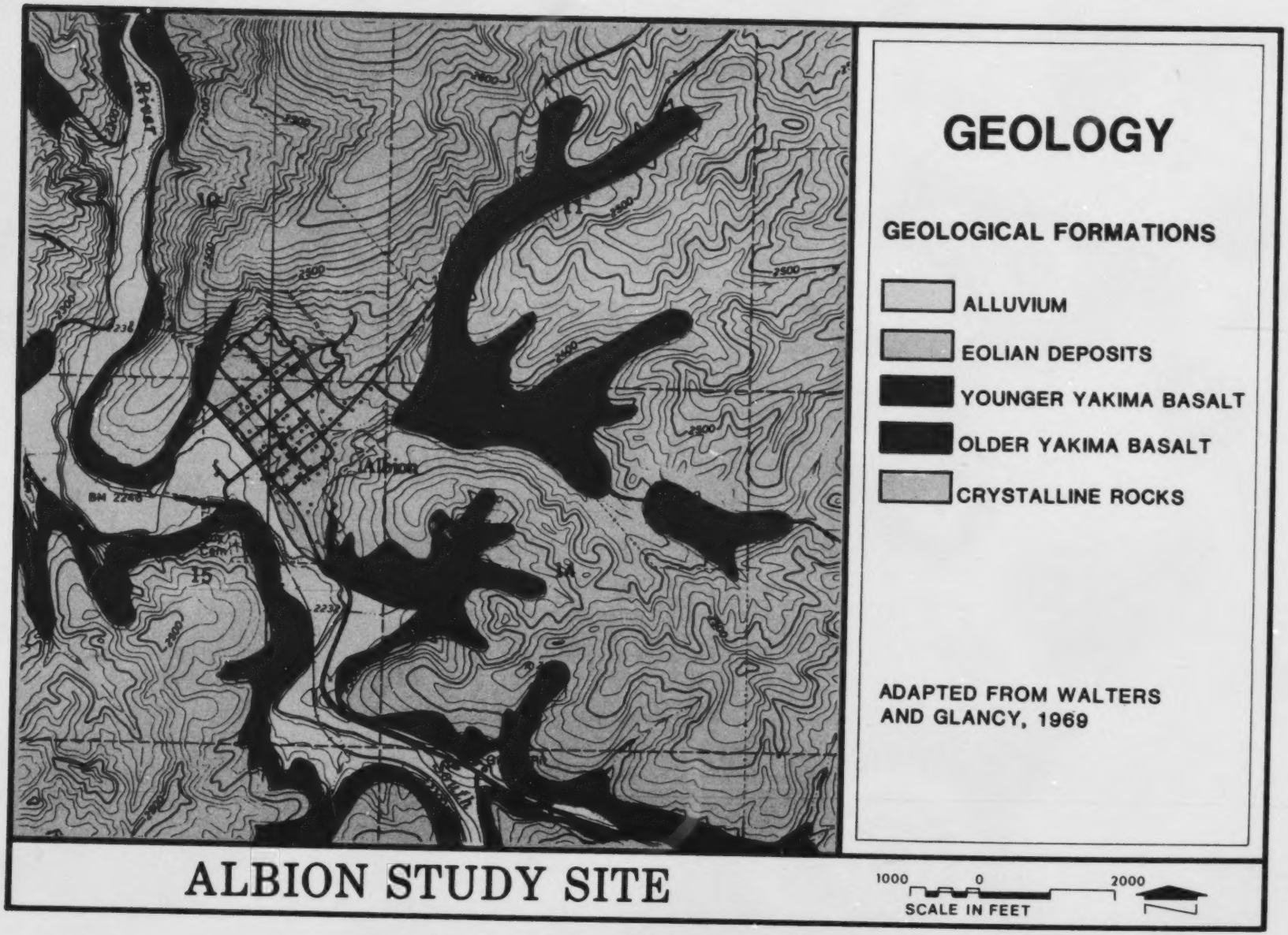
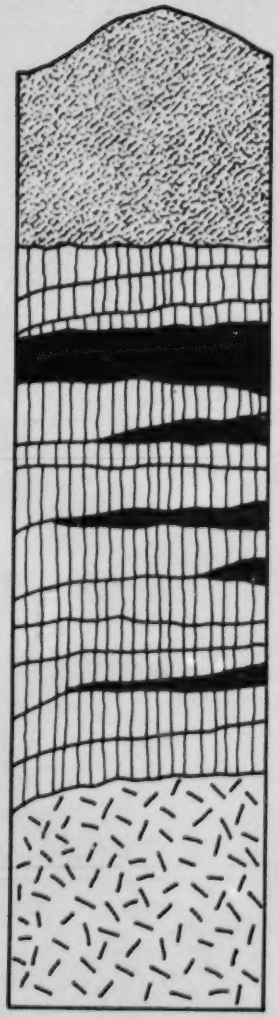


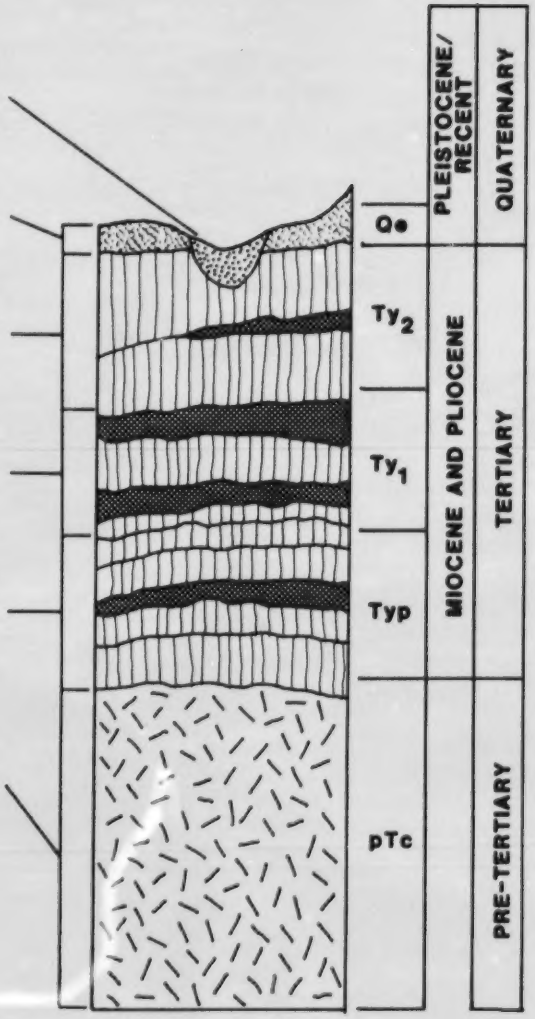
Figure 8 Geology Map

COLUMNAR SECTION

HILLTOP SECTION



STREAMBED SECTION



ALLUVIUM

Fluvial deposits consisting of some rock fragments, sand, silt, and clay. Unit also includes windborne volcanic ash deposits visible in some freshly cut arroyos. Includes alluvial terrace deposits of possible Pleistocene age along Snake River upstream from Riparia. Deposits restricted mainly to major flood plains, and range in thickness from a few feet to 170 feet.

EOLIAN DEPOSITS

Tan to brown deposits of silt and clay-size particles that contain some prominent caliche zones in the western part of the country. Individual deposits not differentiated. Eolian deposits (principally loess) are extensive throughout the county, although erosion has removed considerable quantities in channeled scabland region. Thickness ranges from a few feet to about 300 feet.

YAKIMA BASALT & SEDIMENTARY INTERBEDS OVER ROZA MEMBERS

Includes flows of Priest Rapids Member and flows of possibly younger age. Exposures are dark-gray to black and range from massive- to medium-bedded, depending on the thickness of individual flows. Some vesicular zones are present, but much basalt is very dense. Basalts of this unit are distinguished by lack of megascopically developed plagioclase phenocrysts. Some flows impinge on steptoes of pretertiary crystalline basement rocks that were only slightly covered or never completely buried by basalt flows. Interbeds consist essentially of sand and finer size particles derived mainly from crystalline rocks and pyroclastic detritus. Thickness exceeds 100 feet in many places.

YAKIMA BASALT & INTERBEDS WITH ROZA MEMBER AS UPPERMOST UNIT

Basalt of Roza Member chiefly characterized by distinctive plagioclase phenocrysts ranging from reddish-brown to gray to black. Roza basalt is variable in content, ranging from sparsely to highly vesicular. Interbeds consist of sand and finer sized particles derived mainly from crystalline rocks and pyroclastic detritus. Unit is thousands of feet thick over most of the county; not differentiated in extreme southeast corner, where Roza Member apparently pinches out.

YAKIMA AND (OR) PICTURE GORGE BASALT & SEDIMENTARY INTERBEDS

Includes basalt flows that range from thin- to thick-bedded. Composition of individual flows appears to vary only slightly within project area. Individual lithographic units fine- to coarse-grained basalt, porphyritic basalt, flow breccias, cinder beds, and sedimentary interbeds. Interbeds consist essentially of sand and finer size particles derived mainly from crystalline rocks and pyroclastic detritus. Thickness ranges from hundreds to thousands of feet.

CRYSTALLINE ROCKS

Principally quartzite, phyllite, schist, granite gneiss, granite pegmatite, and granite igneous rocks. Includes a distinctive granitic body exposed along Snake River at Granite Point. Metamorphic rocks, probably metasediments, generally chemically altered, in many places extensively. Unit locally protrudes above all basalt flows in eastern part of county. In other exposures it has been exhumed by recent erosion.

Figure 9 Columnar Section and Lithologic Description

The geology map is illuminated by a columnar section and a lithologic description which explain the depositional or intrusive sequence and the composition of the units (*Figure 9*). A columnar section can be accompanied by a geologic history. Two columnar sections of Albion were used to illustrate both a hilltop and streambed area.

In some regions it is helpful to produce separate maps for bedrock and surficial deposits or regolith. A bedrock geology map shows the continuous solid rock of the continental crust. While the surficial geology maps show the distribution of deposits on the surface of the landscape. In the Albion demonstration area, most of the geologic units are surficial, the wind-blown loess and the alluvium.

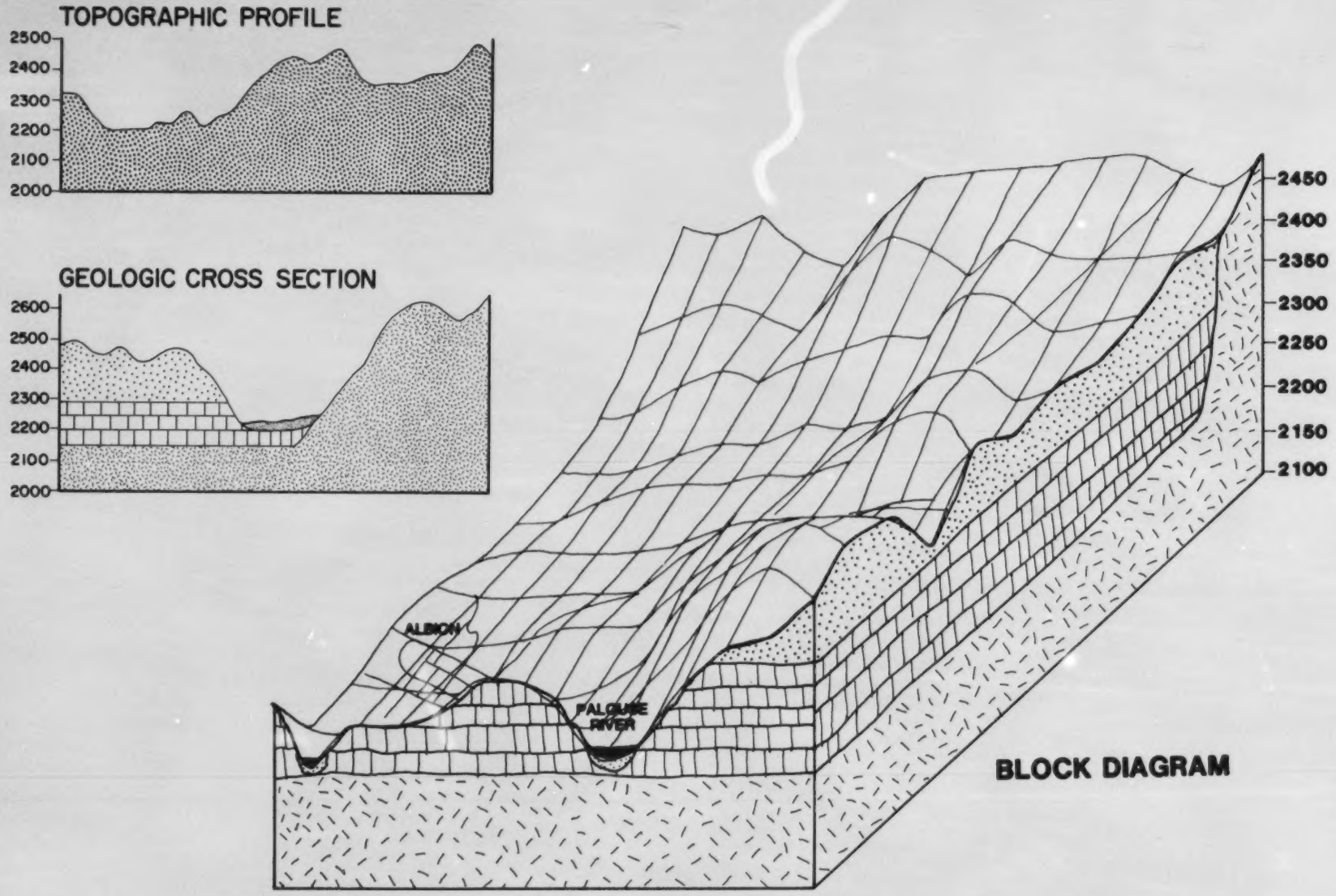


Figure 10 Topographic Profiles, Geologic Cross Section and Block Diagram

Berger (1977) observed that the most important aspect of a geologic analysis is the ability to visualize the units in three dimensions. Topographic profiles, geologic cross sections and block diagrams are three-dimensional tools which are shown in *Figure 10*. *Figure 11* shows symbols commonly used to show structure on geologic maps and representative patterns commonly used to show kinds of rocks in geologic cross sections. The geologic cross sections and block diagrams of the Albion area show the same information as the columnar section. Only geologic cross sections are more specific and show where a formation occurs beneath the landscape. Block diagrams are also especially helpful to visualize an area's physiography.

SYMBOL	DESCRIPTION
18	Strike and dip of strata
90	Strike of vertical strata; tops of strata are on side marked with angle of din
⊕	Structure of horizontal strata; no strike, dip=O
43	Strike and dip of foliation in metamorphic rocks
	Strike of vertical foliation
	Anticline; arrows show directions of dip away from axis
	Syncline; arrows show directions of dip toward axis
21	Anticline, showing direction and angle of plunge
15	Syncline, showing direction and angle of dip
	Normal fault; hachures on downthrown side
	Reverse fault; arrow shows direction of dip, hachures on downthrown side
50 U D	Dip of fault surface; D, downthrown side; U, upthrown side
	Directions of relative horizontal movement along a fault
	Low-angle thrust fault; barbs on upper block

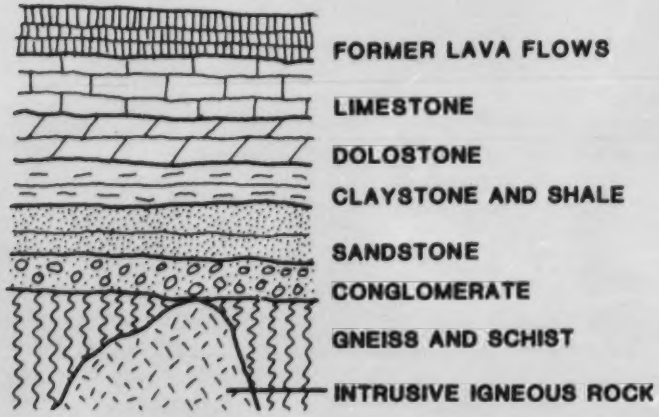


Figure 11 Common Geologic Symbols

SUMMARY OF GEOLOGIC INVENTORY ELEMENTS

1. Depth to bedrock
2. Outcrops
3. Bedrock types and characteristics
4. Cross sections
5. Surficial deposits (regolith)
6. Mineral resources
7. Major fault lines and earthquake zones

MAJOR SOURCES OF INFORMATION

1. The U.S. Geologic Survey (USGS)
   The best source for obtaining information is the circular titled *A Guide to Obtaining Information from the USGS 1978* (Geological Survey Circular 777). It is available from:
   Branch of Distribution
   U.S. Geological Survey
   1200 South Eads Street
   Arlington, Virginia 22202
2. *Bibliography of Geology*
   Published annually and compiled every 10 years by the USGS.
3. State departments of natural resources, mining and ecology
4. College or university libraries

Physiography

The world is a myriad of peaks and depressions, ridges and valleys, rolling hills and flat areas, small bumps and slight slumps, it is uneven, varied. Physiography deals with the physical conditions of the surface of the land. The broad physiography of an area can be determined by the knowledge of the physiographic region in which it lies. For instance, Albion lies in the Palouse physiographic region. A helpful resource for determining physiographic regions is Charles B. Hunt's *Physiography of the United States* (1967).

For the purposes of most regional planning, the important aspects of physiography are elevation and slope. Elevation may be strongly related to slope, soils, geology, hydrology, microclimate, plants and animals and, as such, is an important feature in analyzing landscapes. Elevation maps are easily constructed by selecting intervals from the base maps. Altitudes can be represented by coloring spaces between topographic intervals. Elevation changes are depicted in shades of browns, yellows or greys with felt markers, colored pencils or crayons, becoming lighter as elevation increases (*Figure 12*). In the Albion area, the highest point is slightly over 2700 feet above sea level, while the lowest bench mark is 2232 feet.

Because of the dune-like topography of the Albion area, there are many steep slopes (*Figure 13*). The slopes of Albion fall largely

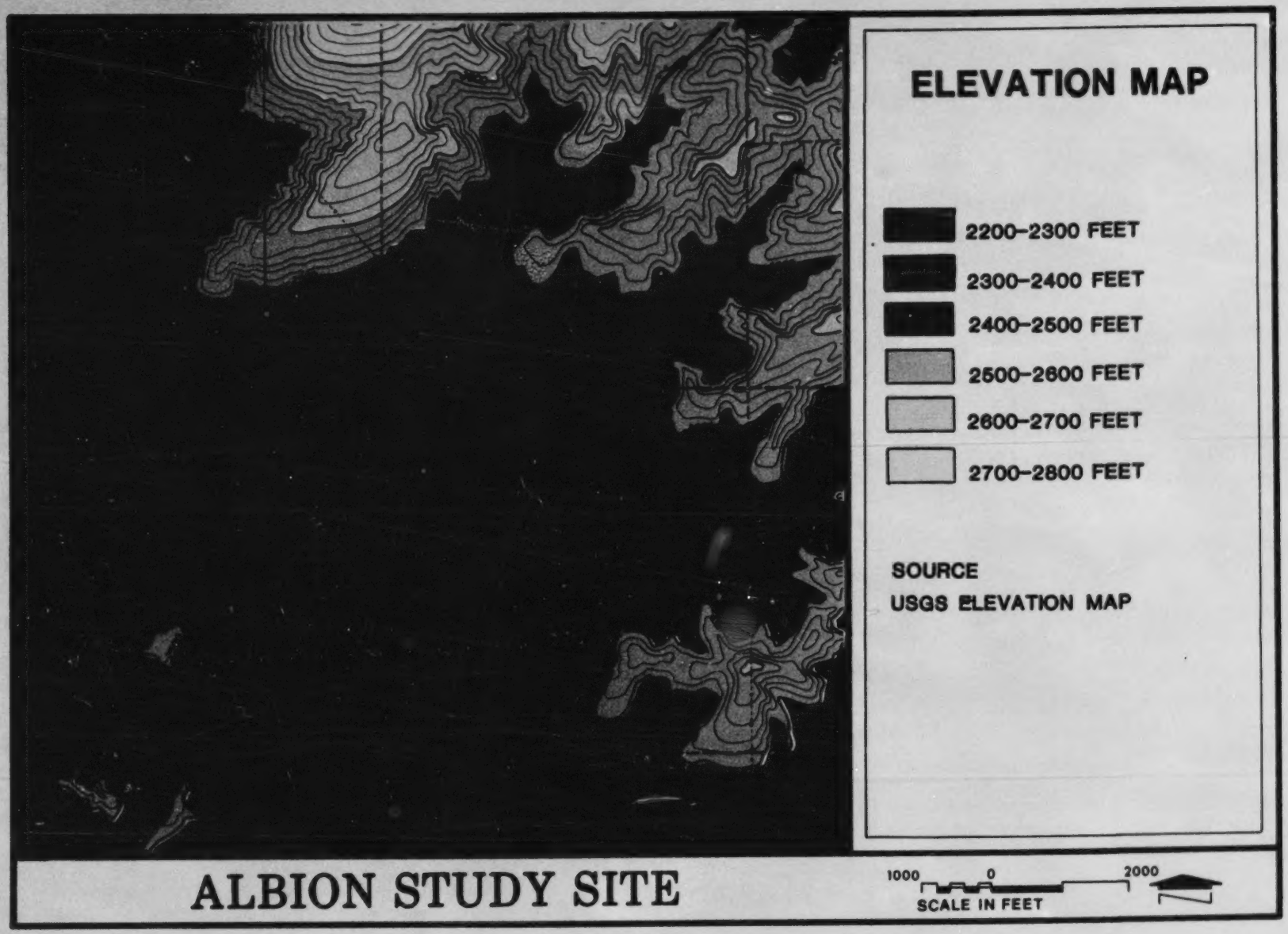


Figure 12 Elevation Map

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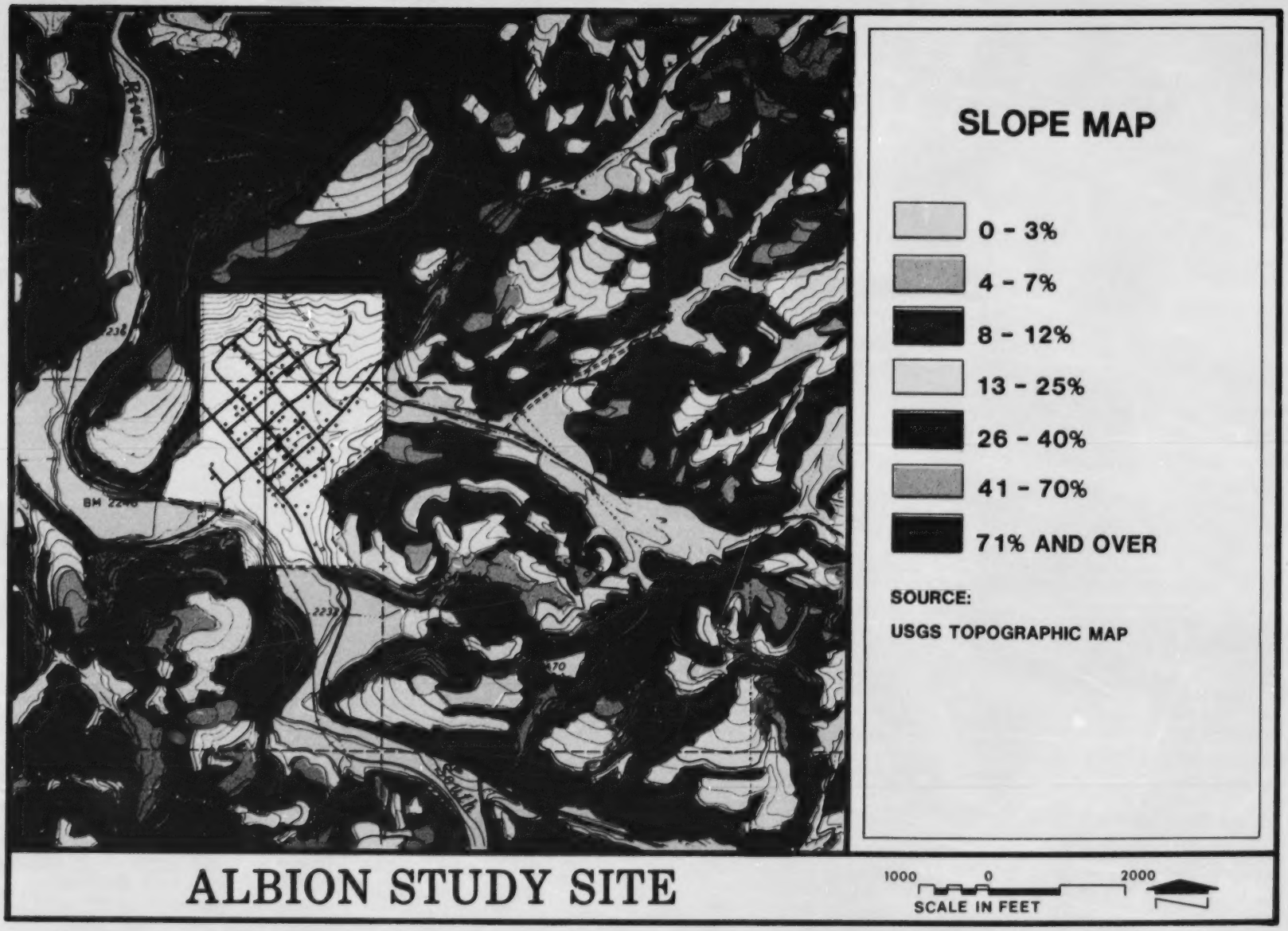

Figure 13 Slope Map

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into two categories: 7-12% and 12-25%. The notable exceptions are drainage areas which are relatively gentle and flat—less than 3% in the flood plains. *Figure 14* illustrates the angle of these slopes.

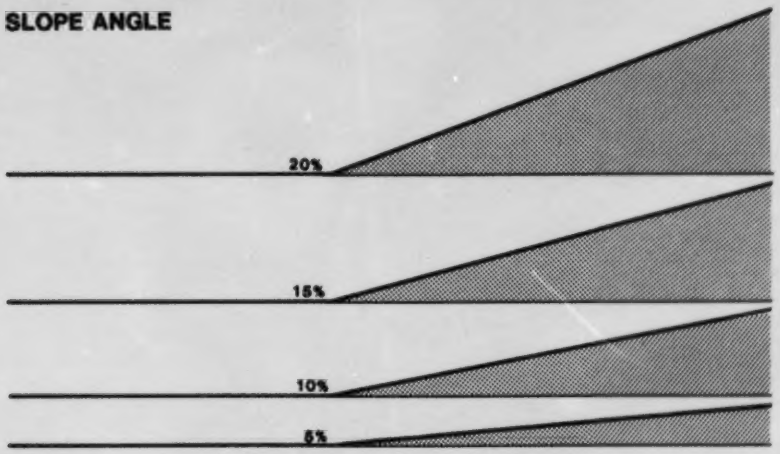

Figure 14 Angle of Slopes

SUMMARY OF PHYSIOGRAPHY INVENTORY ELEMENTS

1. Physiographic region
2. Elevation
3. Slope

MAJOR SOURCES OF INFORMATION

1. USGS
2. College or university libraries
3. *Physiography of the United States* (Hunt)

Hydrology

Bernard Palissy first explained that springs originate from and are fed by rain and rain alone. He showed how this happens: sea water evaporates, is condensed to form rain, which falls, percolates into the ground and emerges later as springs and rivers which return the water to the sea. This is the hydrologic cycle (*Figure 15*). The hydrologic cycle expresses the balance of water in its various forms in the air, on land, and in the sea (Morisawa 1968, p. 12).

A water budget can be constructed for an average year, which represents the inflow and outflow through the hydrologic cycle. *Figure 16* illustrates the water budget for Albion. As can be seen, there is a water surplus early in the year followed by a period when moisture in the soil is being utilized. Then through the summer and early autumn there is a period of water deficiency, and finally moisture is recharged in the soil.

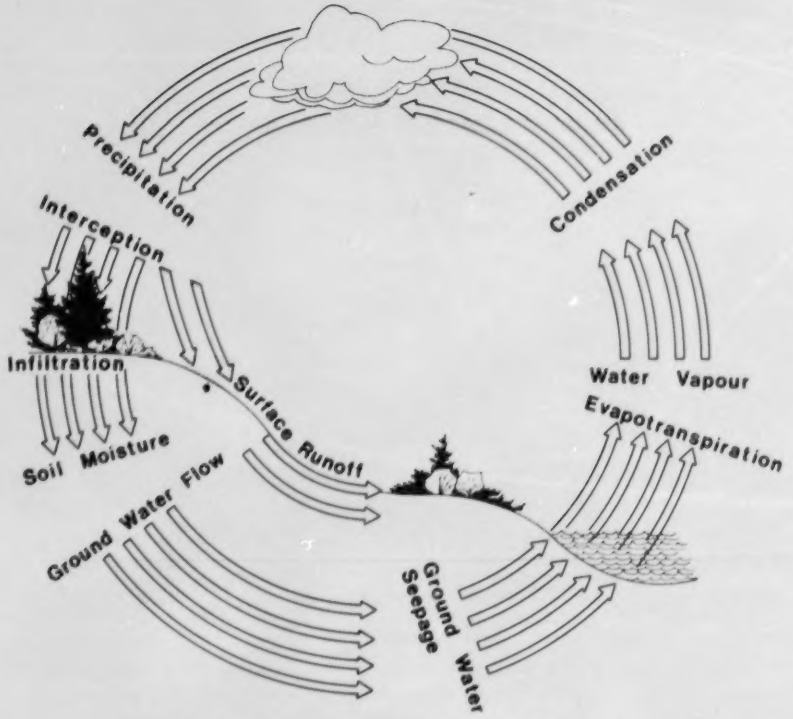

Figure 15 Hydrologic Cycle

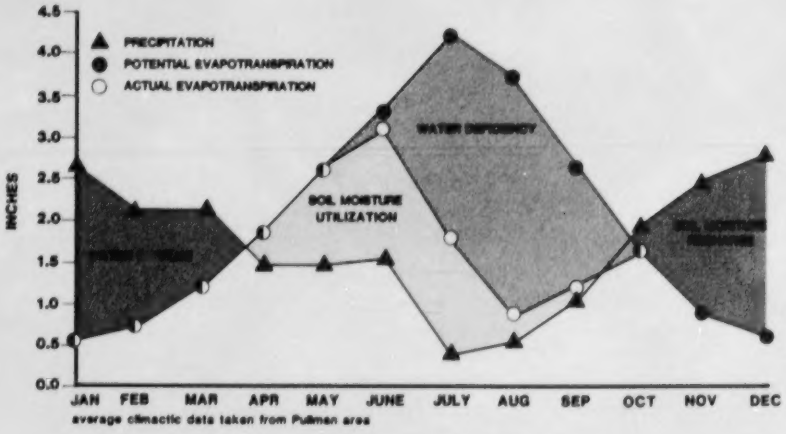

Figure 16 Water Budget for Albion

As can be seen in the hydrologic cycle and water budget, hydrology deals with the movement of water through the landscape both on the surface and in the ground. Groundwater is that water which fills all the unblocked pores of material lying beneath the surface. Surface water is that which flows above ground. Depth to water table, water quality, aquifer yields, direction of movement and the location of wells are important groundwater factors. Data concerning these factors can be obtained from various sources including the U.S. Environmental Protection Agency (EPA), the USGS, the Soil Conservation Service (SCS), various state agencies, and individual well owners. From the geology map, the location of aquifers can be determined.

Albion's surface water map reveals several things about the area including its drainage, stream orders and flood plains. Drainage basins are the morphological units of surface water. A river basin represents the drainage area drained by a stream and its tributaries. It is bounded by a divide which separates it from adjacent watersheds. For purposes of comparison within and among drainage areas, a hierarchy of streams has been set up wherein streams are ranked according to order (Morisawa 1968). Depending on the size and location of the planning study area, a whole drainage basin, a portion of a basin or several basins may be included. Albion includes a portion of a basin.

Although several methods have been suggested for stream ordering, that proposed by Strahler (1957) is the most straightforward. According to his system, stream orders are designated as first, second, third and so on. First order streams are primary drainage ways; they are fingertip tributaries at the head of the stream system. Second order streams are formed by the confluence of two first order streams and third order streams are formed by the confluence of two second order streams and so on (*Figure 17*).

First order streams are usually at higher elevations and travel a shorter distance over a steeper grade than second order streams. Second order streams are at higher elevations and travel a shorter distance over a steeper grade than third order streams and so on. Gravity causes this manner of stream movement toward a steady state. This can be expressed graphically by plotting elevation *vs.* stream length for the streams in the study area (*Figure 17*). Average stream length can also be plotted against stream order. Morisawa observed that streams always seek out and take advantage of any weakness in the rocks over which they flow. Thus, the patterns of stream drainage on the landscape are determined by the regional geologic structure. Common types of drainage patterns are also shown in *Figure 17.*

Flooding is the general and temporary condition of a partial or complete inundation of normal dry land areas from either the overflow of streams, river and other inland water (*Figure 18*), or abnormally

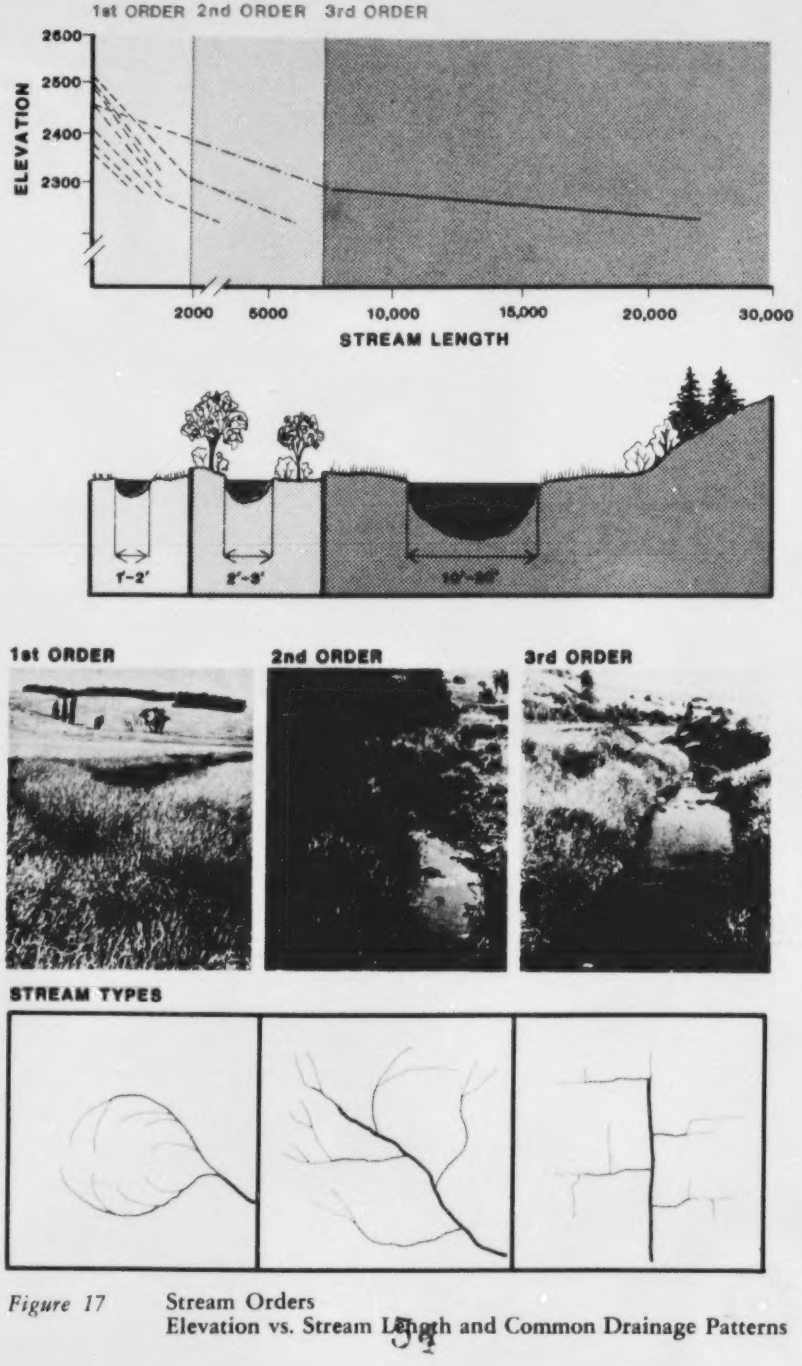

Figure 17 Stream Orders
Elevation vs. Stream Length and Common Drainage Patterns

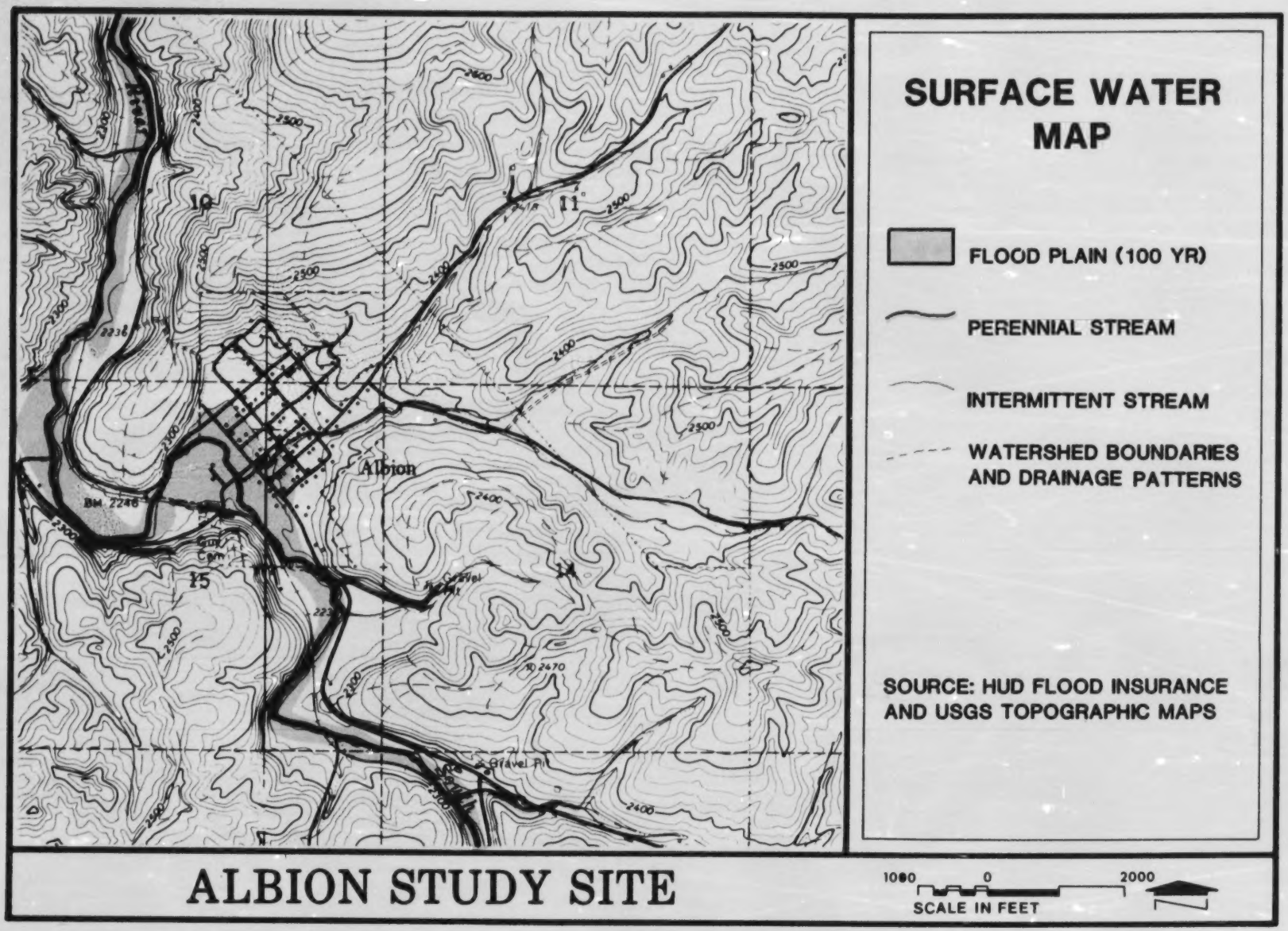

Figure 18 Surface Water Map

high tidal water or rising coastal waters resulting from severe storms, hurricanes, or tsunamis. A flood is also any relatively high flow as measured by either gauge height or discharge quality (Waananen et al. 1977). The South Fork of the Palouse River which flows through the study site is prone to periodic flooding. Part of the town of Albion lies in the flood plain.

SUMMARY OF HYDROLOGIC INVENTORY ELEMENTS

A. Groundwater systems
   1. Aquifer recharge areas
   2. Consolidated and unconsolidated aquifer location and yield
   3. Well locations and yields
   4. Water quality
   5. Water table, artesian supplies
   6. Seasonally high water table
   7. Water-bearing characteristics of geologic cross sections

B. Surface Water Systems
   1. Watershed and drainage basins
   2. Stream, lake, estuary and wetland locations
   3. Water quality
   4. Stream volumes
   5. Lake levels
   6. Floodplains, flood hazard areas
   7. Water supply systems
   8. Sewage treatment systems
   9. Existing industrial disposal systems and discharge points
   10. Existing solid waste disposal sites affecting water quality
   11. Existing storm sewer systems and discharge points
   12. Algal bloom problems
   13. Aquatic weed problem areas
   14. Fish hatcheries and stocking areas

MAJOR INFORMATION SOURCES

1. USGS
2. The U.S. Fish and Wildlife Service
3. The Soil Conservation Service (SCS)
   There is a state conservationist located in each state and a local soil scientist in almost every county in the nation. Both are invaluable resources.
4. The U.S. Army Corps of Engineers
5. The U.S. Department of Housing and Urban Development (National Flood Insurance Program)
6. The U.S. Forest Service
7. The U.S. Environmental Protection Agency (EPA)
8. National Marine Fisheries Service (U.S. Department of Commerce)
9. State departments of natural resources, mining, and ecology
10. Individual well owners

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Soils

Soil occupies the unique position between the lithosphere and atmosphere, between the physical and biological environments. Soil is a natural, three-dimensional body on the earth's surface that supports plants. Its properties result from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time. Because of its interface with so many other processes, soil often can reveal more about an area than any other natural factor. It is fortunate that many dedicated soil scientists have mapped soil information for almost the entire United States.

The soils series map (*Figure 19*) shows the types of soils in the Albion area. Note the various names given different soil types by the soil scientists. These soils are silt loam in texture and were formed in the very deep loess deposit. *Figure 20* shows the soil textural classes as developed by the USDA. In some places soil depth to bedrock is greater than 40". Their permeability is low.

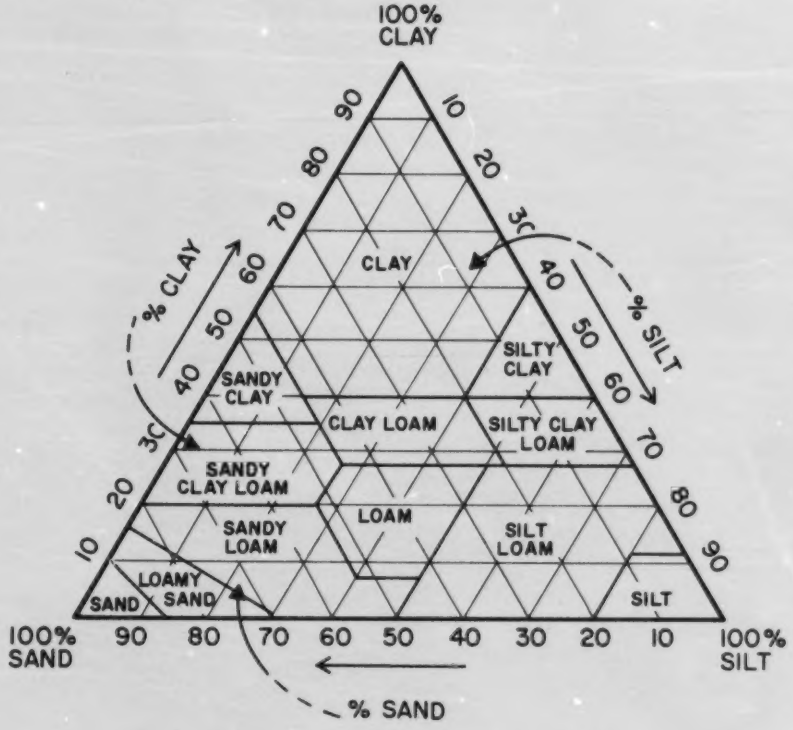

Figure 20 Soil Textural Classes

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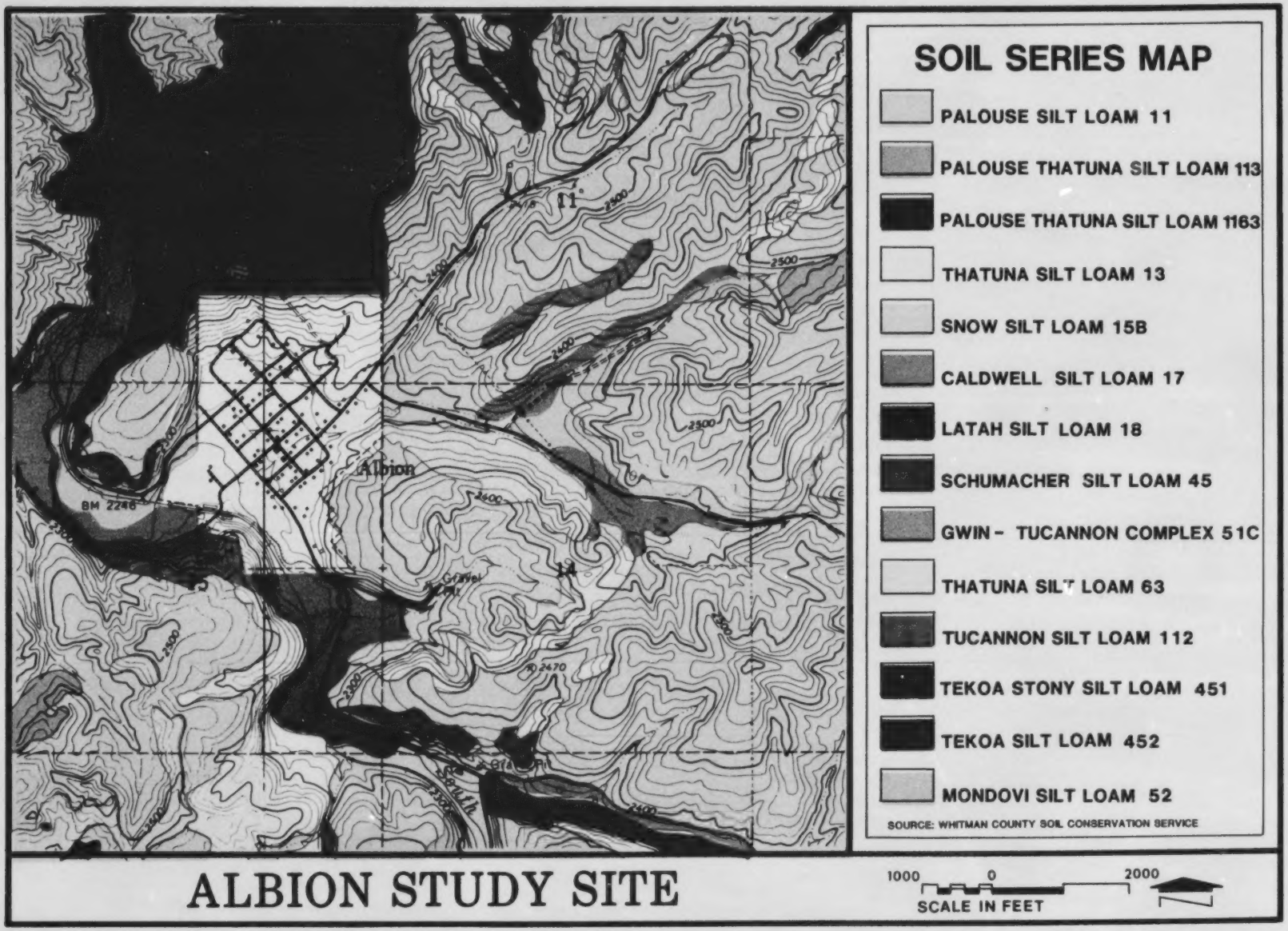

Figure 19 Soils Series Map

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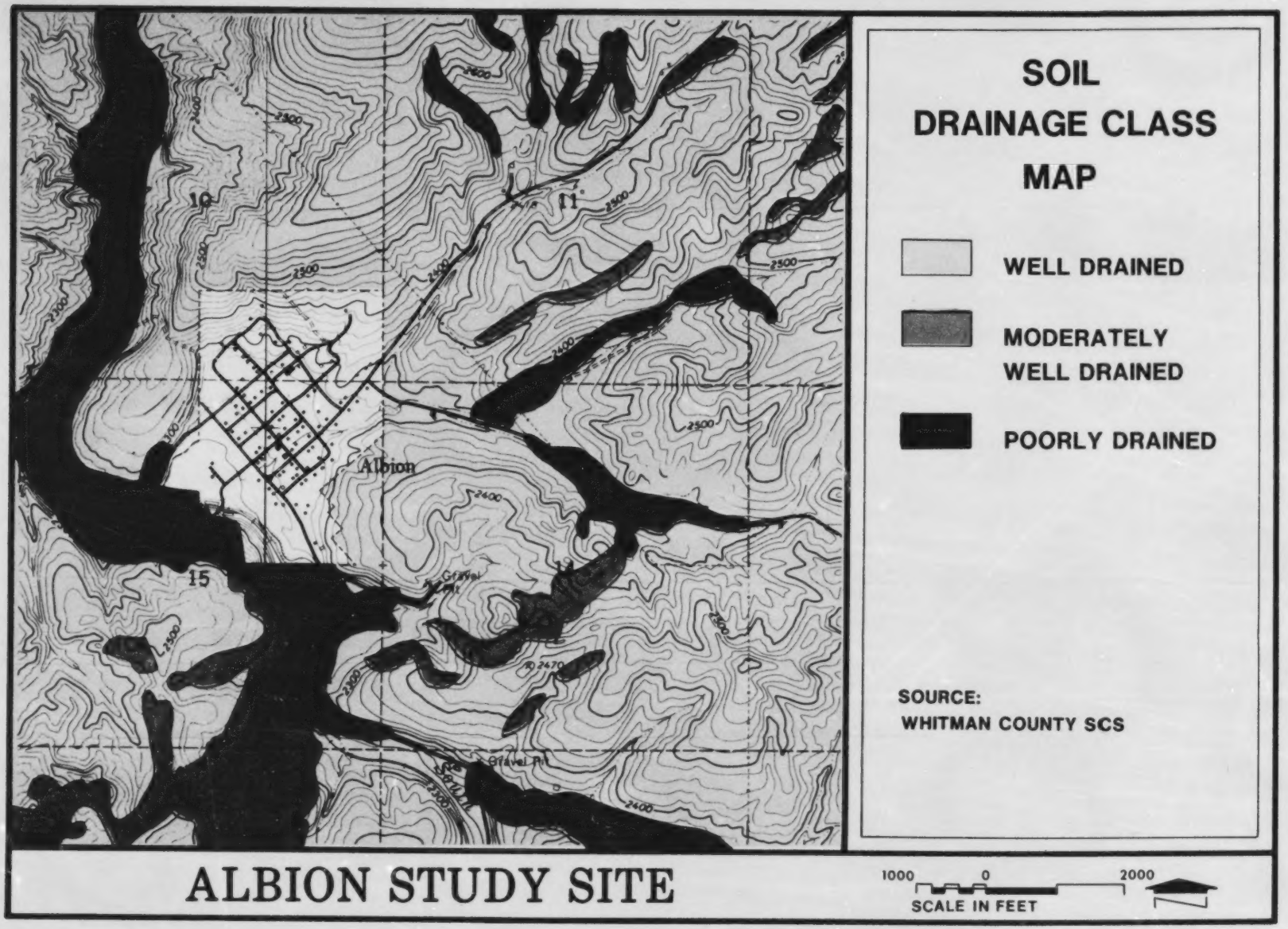

Figure 22 Drainage by Soil Type Map

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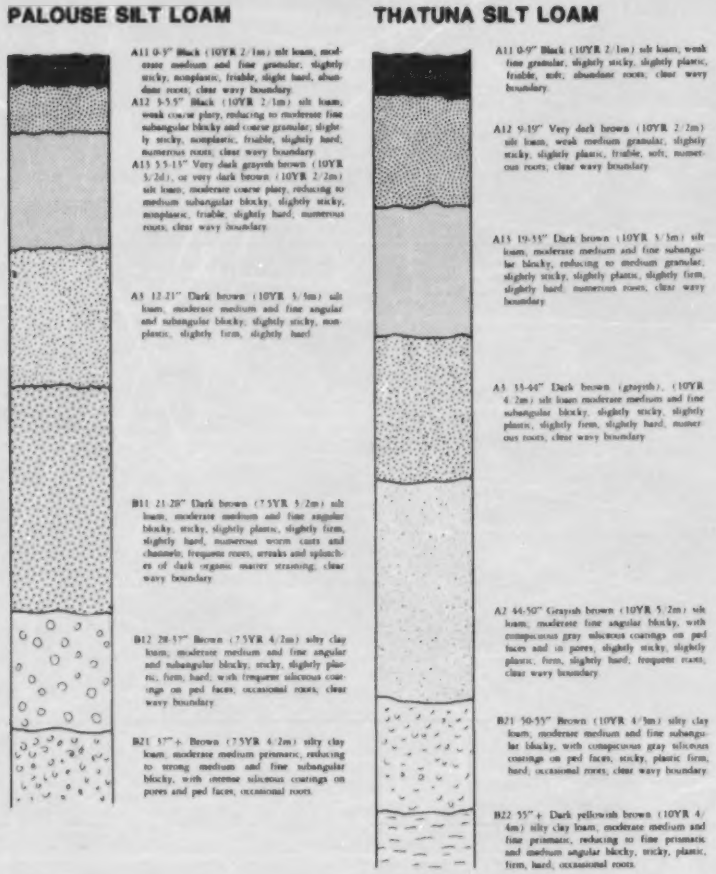

Figure 21 **Soil Profiles**

Soil profiles can illustrate these characteristics in two dimensions (*Figure 21*). Palouse and Thatuna soils are shown in these examples. The drainage map (*Figure 22*) can be compared with the elevation and slope maps. Poor drainage, for instance, occurs in the lower elevations at a 3-15% slope where runoff from the higher areas has produced rivers, streams and gullies. Caldwell silt loams and Latah silt loams are the poorest drained soils near Albion. Moderate drainage areas in Albion are usually found on northeast facing slopes from middle to high elevations. These soils are formed just below the crest of hills and ridges on 15-25% slopes. The dominant soil type in the area, Palouse silt loam, is well drained. These soils occur on various slopes at various elevations (Brunton et al. 1977; Whitman County Soil Conservation Service, no date).

Soil erosion is a critical problem in the Palouse (*Figure 23*). In the Albion area, potential for erosion ranges from slight to severe. Serious soil erosion in the area is a result of steep slopes, low permeability, winter precipitation, and farming practices.

A typical Palouse hill is shown in *Figure 24*. All the soil types were derived from the same parent material—loess. South-facing and west-facing slopes are generally longer and less steep than north and east exposures. The hilltops or ridgetops have lost nearly all the original topsoil by the combined action of water and tillage erosion (Kaiser 1967).

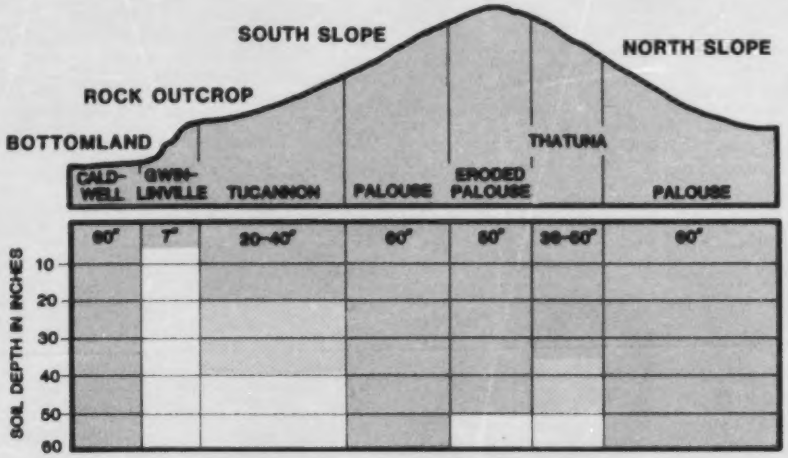

Figure 24 **Typical Palouse Hill**

SUMMARY OF SOILS INVENTORY ELEMENTS

1. Soil series
2. Permeability
3. Texture
4. Profiles
5. Erosion potential
6. Drainage potential
7. Catenas or typical areas

MAJOR SOURCES OF INFORMATION

1. SCS
2. The Soil Conservation Society of America
3. College or university libraries
4. County extension agents

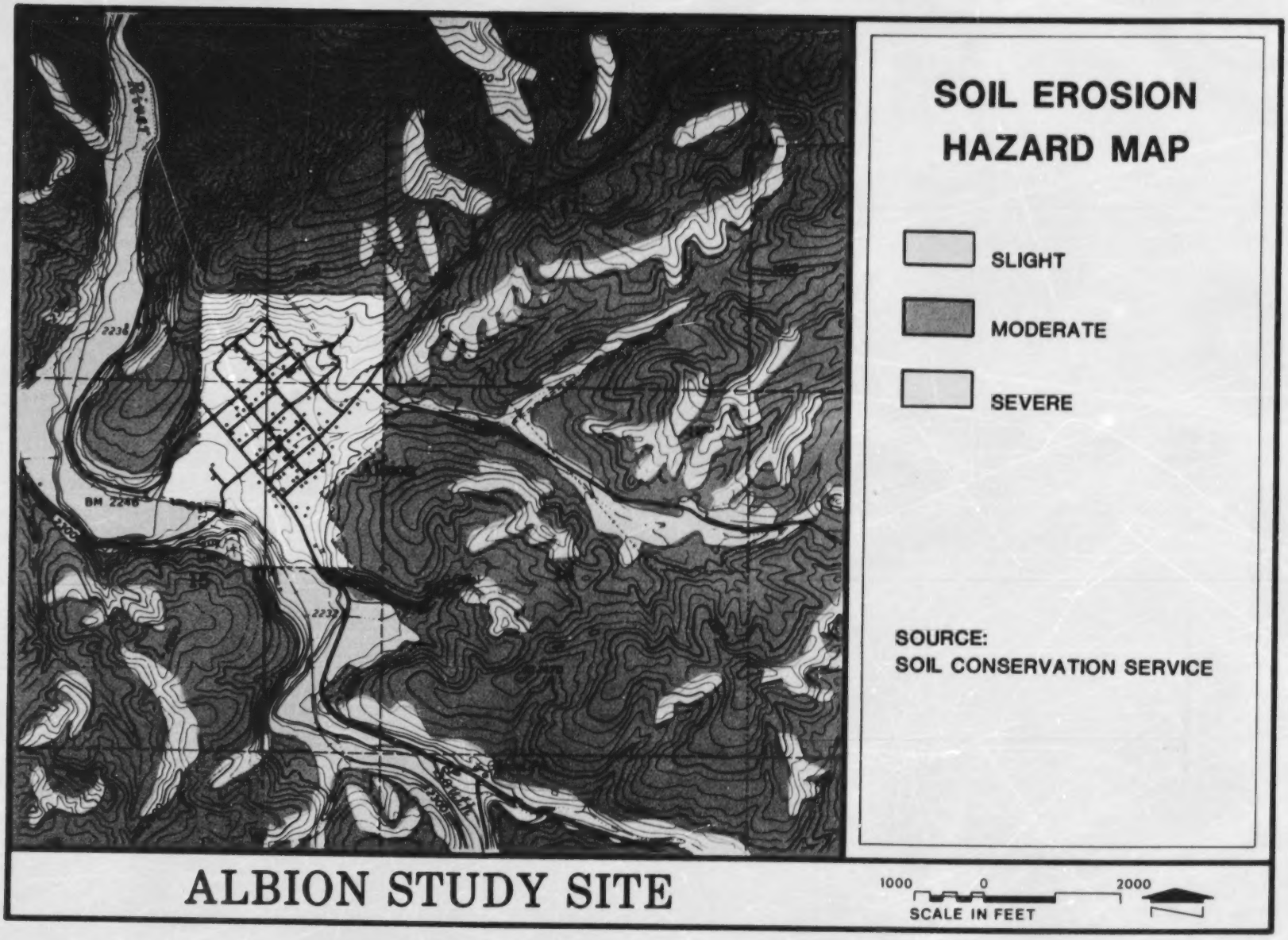

Figure 23 Potential Erosion by Soil Type Map

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Climate

Climate is the set of meteorological conditions characteristic of an area over a given length of time. Information about both macro- and microclimate is helpful for planning. In the planning of rural regions for issues such as farmlands preservation, information about climate and soils is probably the most important biophysical process to understand. Farmers are intimately involved with climate and soils; these are the basis of their livelihood.

The macroclimate of the Palouse is influenced by both continental and marine weather patterns (*Figure 25*). Located in the inland basin between the Cascade and Rocky Mountains, the region is defined by the Koppen system as a middle latitude steepe (Bsk). Sheltered by the Cascades from the moderating influence of the Pacific and open to the cold waves sweeping down from Canada, the Palouse experiences a wide temperature range (*Figure 26*). Hot, dry and sunny summer days with cool evenings are common, with a maximum temperature of 110°F having been recorded. Meanwhile, winters are cold with frequent periods of cloudy or foggy weather. During an average winter, the maximum temperatures range from 30°F to 40°F, and minimums range from 15°F to 30°F. Colder temperatures occur when arctic air moves into the area, usually for brief periods. The lowest recorded was 37°F below zero (Ledwitz 1977, U.S. Department of Agriculture 1978).

Figure 25 Macroclimatic Influences

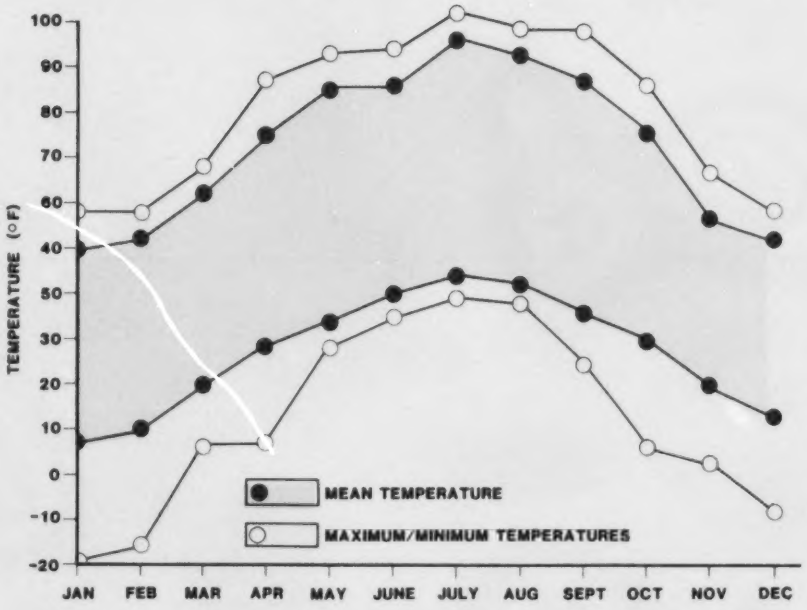

Figure 26 Average Temperature Ranges for Pullman, Washington

Precipitation in Whitman County ranges from 11 inches annually on its western border to above 22 inches annually on its eastern border. Most of this precipitation occurs in the winter months (*Figure 27*). In Whitman County, the prevailing direction of the wind is northeast in winter and southeast in summer. The higher velocities in both winter and summer vary from southerly to westerly directions. Rapidly moving weather systems cause blowing dust during the spring and fall. There is a wide range in the relative humidity from the low morning temperatures to the warmer afternoons (Ledwitz 1977; U.S. Department of Agriculture 1978).

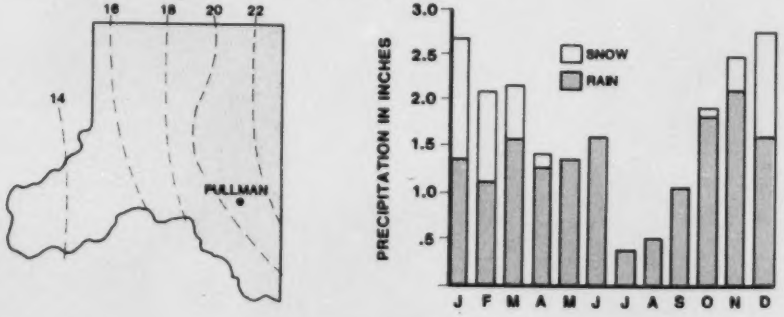

Figure 27 Average Precipitation by Month for Pullman, Washington

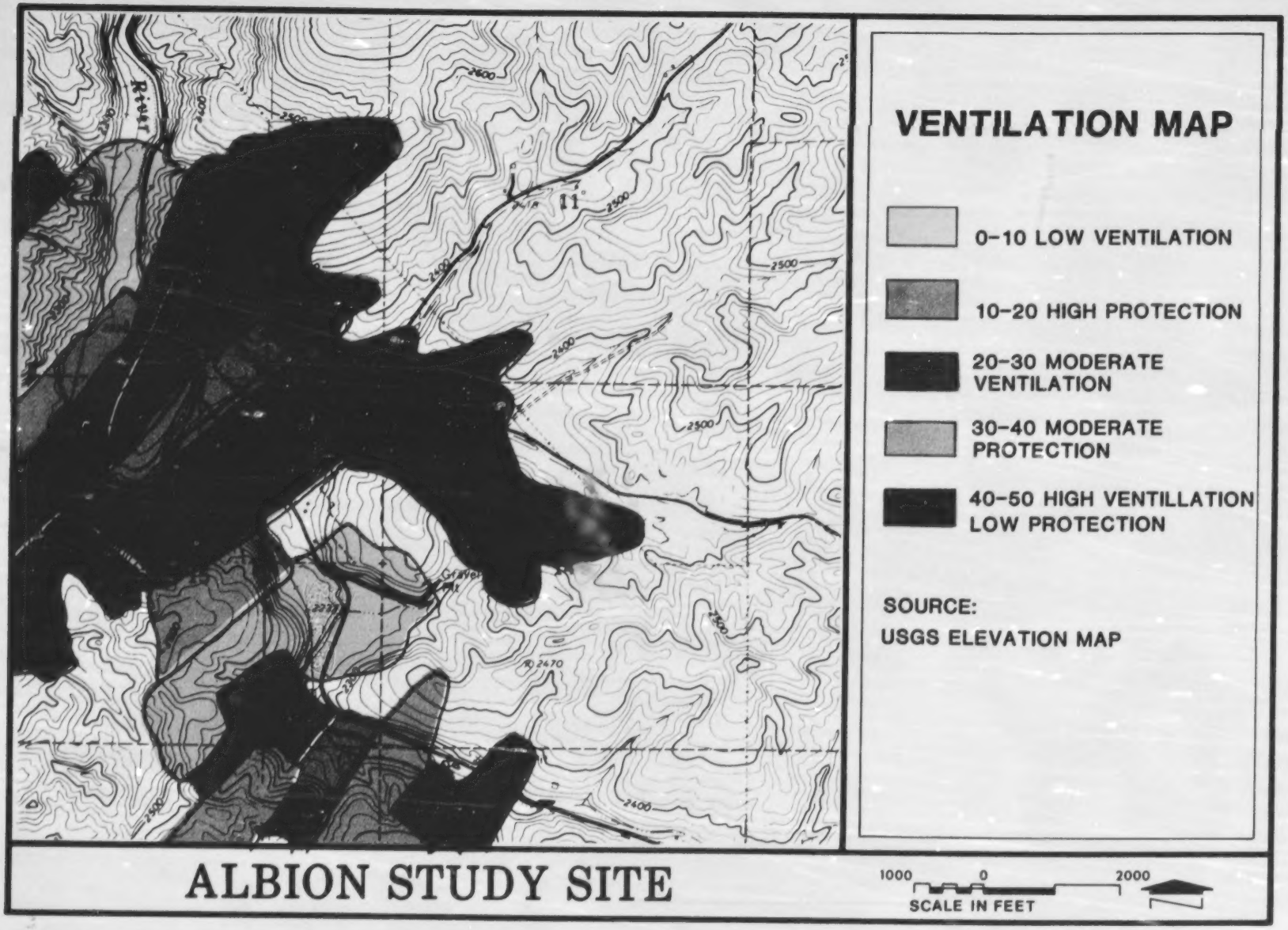

Figure 28 **Ventilation Map**

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Microclimate is the air space affected by characteristics close to the earth such as slope aspect, exposure, elevation, soil and vegetation. Some important microclimatic elements to consider are ventilation, fog and frost, solar radiation and vegetative changes.

Ventilation is the circulation of fresh air across the landscape. It is largely dependent on landforms and wind direction. *Figure 28* illustrates relative levels of ventilation from the Albion area. Ventilation is greatest in those areas where the terrain is aligned with the prevailing wind.

Subtle topographic changes and their relative elevation greatly affect temperature near the ground surface. These changes in temperature, in turn, affect an area's susceptibility to fog and frost. The Albion area's complex topography results in varying degrees from fog and frost susceptibility (*Figure 29*).

Figure 29 Fog and Frost Susceptibility

Solar radiation is a result of slope steepness and aspect (*Figure 30*). Satterlund and Means (1979) have observed that solar radiation is the primary forcing variable in energy exchange processes that determine ecosystem distribution, composition and productivity. It also melts snow and powers the hydrologic cycle, and it significantly influences agricultural productivity.

Vegetation influences, and is a result of, microclimate in several ways. Ventilation, fog and frost, and solar radiation all are modified by changes in vegetation. *Figure 31* illustrates some of the ways vegetation influences microclimate near Albion.

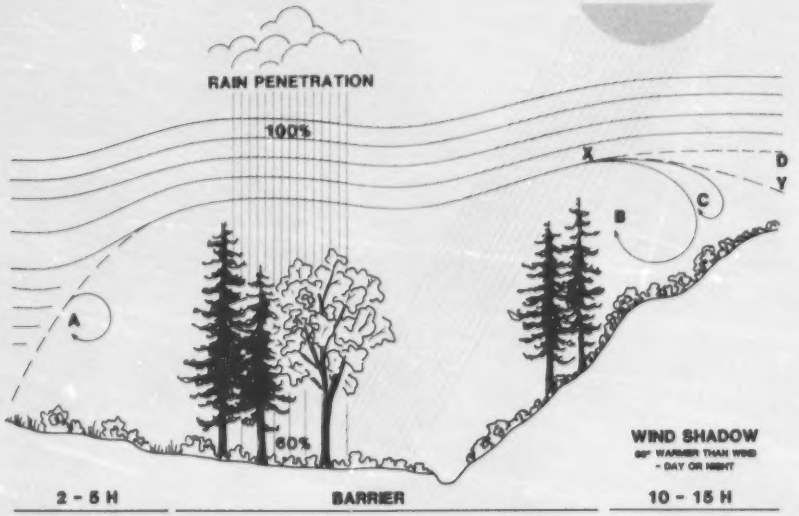
SUMMARY OF CLIMATE INVENTORY ELEMENTS

A. Macroclimate
   1. Koppen classification
   2. Average temperatures
   3. Average precipitation
   4. Prevailing winds
   5. Relative humidity

B. Microclimate
   1. Ventilation
   2. Fog and frost
   3. Solar radiation
   4. Vegetative changes

MAJOR SOURCES OF INFORMATION

1. The National Weather Service
2. The National Oceanic Atmospheric Association (NOAA)
   The best source for climate information is:
   Environmental Data Service
   National Oceanic and Atmospheric Administration
   Asheville, NC 28801
   Regional information is available concerning monthly precipitation, temperature and wind data.
3. Local weather stations and/or airports
4. College or university libraries
5. Farmers



Adapted from Higashi et al., 1977

Figure 31 Vegetation Influences on Microclimate

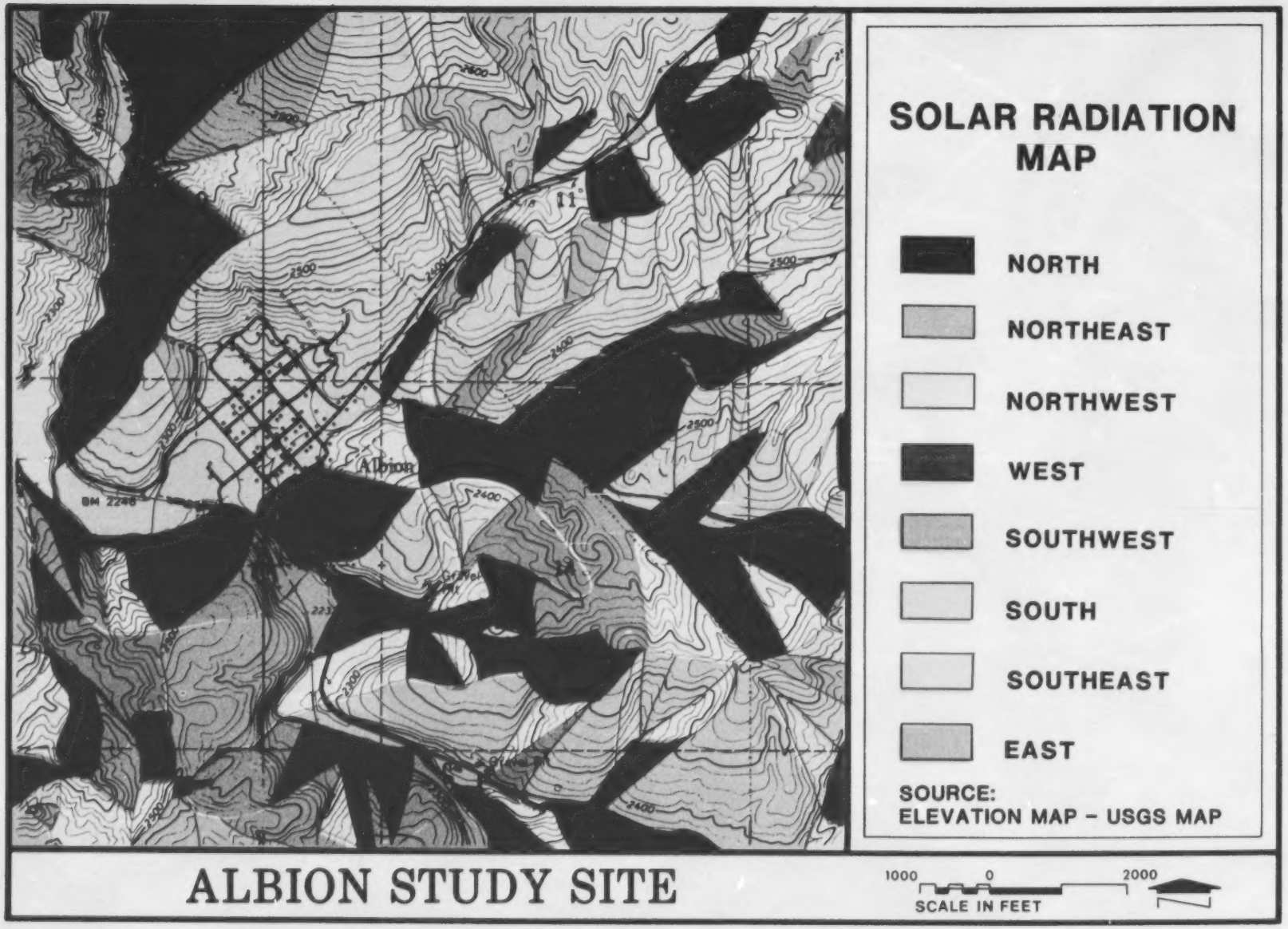


Figure 30 Solar Radiation Map

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Table 1

U.S. GEOLOGICAL SURVEY LAND USE AND LAND COVER CLASSIFICATION SYSTEM

Level I	Level II
1 Urban or built-up land	11 Residential
	12 Commercial and services
	13 Industrial
	14 Transportation, communications and services
	15 Industrial and commercial complexes
	16 Mixed urban or built-up land
	17 Other urban or built-up land
2 Agricultural land	21 Cropland and pasture
	22 Orchards, groves, vineyards, nurseries, and ornamental horticultural
	23 Confined feeding operations
	24 Other agricultural land
3 Rangeland	31 Herbaceous rangeland
	32 Shrub and brush rangeland
	33 Mixed rangeland
4 Forest land	41 Deciduous forest land
	42 Evergreen forest land
	43 Mixed forest land
5 Water	51 Streams and canals
	52 Lakes
	53 Reservoirs
	54 Bays and estuaries
6 Wetland	61 Forested wetland
	62 Nonforested wetland
7 Barren land	71 Dry salt flats
	72 Beaches
	73 Sandy areas other than beaches
	74 Bare exposed rocks
	75 Strip mines, quarries, and gravel pits
	76 Transitional areas
	77 Mixed barren land
8 Tundra	81 Shrub and brush tundra
	82 Herbaceous tundra
	83 Bare ground
	84 Mixed tundra
9 Perennial snow ice	91 Perennial snowfields
	92 Glaciers

Vegetation

The ecologist, Robert E. Ricklefs, observed that "life is an extension of the physical world" (1973, p. 81). Living things are a result of the processes we have discussed thus far plus their interaction with other life forms. Vegetation refers to plant life—trees, shrubs, herbs and grasses. Because of the omnipresence of vegetation, it would seem that it would be simple to inventory. This, however, is not the case. For various reasons, vegetation has not been inventoried to the extent that geology, hydrology, soils or climate have. As a result, plants are often ignored in the planning process.[5]

Albion's vegetative unit map shows the major communities of the area *(Figure 32)*. There are several ways to classify land cover. One helpful system is the USGS Land Use and Land Cover Classification System which was developed for use with remote sensor data (Anderson et al. 1976) (*Table 1*). Once a system is selected, it is necessary to identify the specific units. The most straightforward method is to use aerial photographs to identify the areas, then field check the units.

In Albion, the units that were identified include shrubland, woodland, grassland, mixed shrub/woodland, mixed shrub/grassland, pastures, croplands, riparian and farmsteads. After the units are identified and mapped, it is often helpful to list the individual species in the area *(Table 2)*. The ecologist, Rexford Daubenmire, spent a large portion of his career identifying communities in the Palouse (1970). Because of his efforts, compiling a vegetative unit list for Albion is fairly easy. In other areas this task is more difficult.

Table 2

VEGETATIVE UNIT LIST

PASTURES	
Agropyron spicatum	Bluebunch Wheatgrass
Collinsia parviflora	Small-flowered Blue-eyed Mary
Eriogonum heracleoides	Wyeth Buckwheat
Festuca idahoensis	Idaho Fescue
Poa pratensis	Kentucky Bluegrass
Thlaspi arvense	Field Pennycress
GRASSLANDS	
Achillea millefolium	Yarrow
Agropyron spicatum	Bluebunch Wheatgrass
Antennaria luzuloides	Silvery Pussy-toes
Artemisia frigida	Pasture Sagebrush
Artemisia tridentata	Big Sagebrush
Aster sp.	Aster
Astragalus spaldingii	Spalding's Milk-vetch
Balsamorhiza sagittata	Arrowleaf Balsamroot
Brodiaea douglasii	Douglas' Brodiaea
Bromus japonicus	Japanese Brome

[5]An obvious exception is that work done by the U.S. Forest Service or state agencies responsible for forestry and range programs. In this case, vegetation is viewed as a resource.

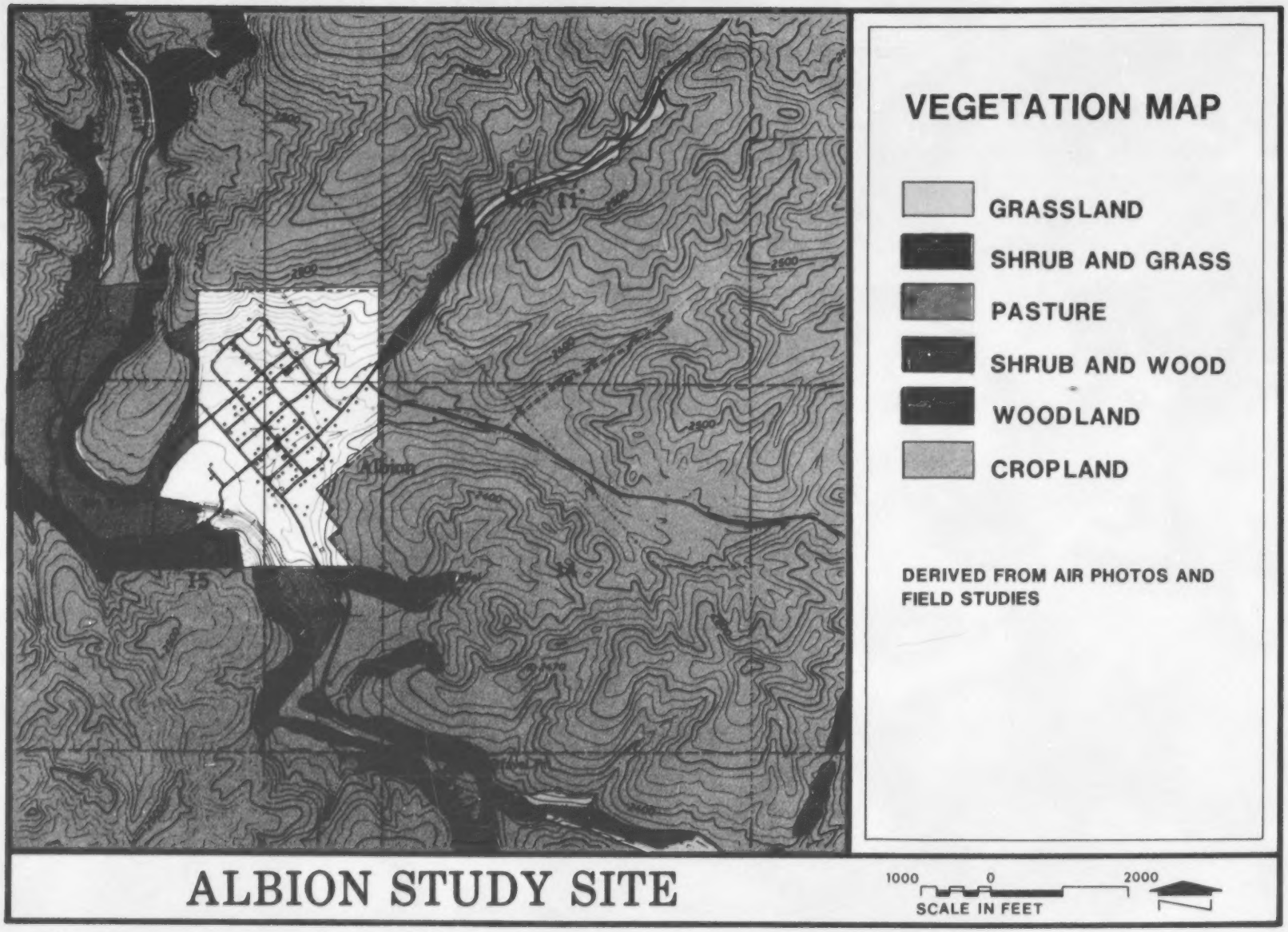

Figure 32 Vegetation Unit Map

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Bromus mollis	Soft Brome
Calochortus elegans	Northwest Mariposa Lily
Castilleja cusickii	Cusick's Paintbrush
Centaurea cyanus	Cornflower
Carex geyeri	Elk Sedge
Collinsia parviflora	*Small-flowered* Blue-eyed Mary
Draba verna	Spring Whitlow grass
Epilobium paniculatum	Autumn Willow-weed
Erigeron corymbosus	Long-leaf Fleabane
Eriogonum heracleoides	Wyeth Buckwheat
Festuca idahoensis	Idaho Fescue
Fritillaria pudica	Yellow Bell
Gaillardia aristata	Blanket-flower
Geranium viscosissimum	Sticky Purple Geranium
Geum triflorum	Prairie Smoke Avens
Haplopappus liatriformis	Palouse Goldenweed
Helianthella uniflora	Rocky Mountain Helianthella
Hieracium albertinum	Western Hawkweed
Iris missouriensis	Western Blue Flag
Koeleria cristata	Koeler's Grass
Lithophragma bulbifera	Rocketstar
Lithophragma parviflora	Small-flowered Fringecup
Lithospermum ruderale	Nine-leaf Lomatium
Lomatium triternatum	Silky Lupine
Lupinus sericeus	Western Gromwell
Microsteris gracilis	Pink Microsteris
Montia linearis	Narrowleaved Montia
Potentilla gracilis	Cinquefoil
Senecio integerrimus	Western Groundsel
Sisyrinchium inflatum	Purple-eyed Grass
Stellaria nitens	Shining Chickweed
Thlaspi arvense	Field Pennycress
Zigadenus venenosus	Deadly Zigadenus

Albion's physiognomic profiles show these units in three dimensions (*Figure 33*). Peter Skaller observed that "besides revealing a great deal about ecosystem processes, physiognomy affords a quick look at the structural components of wildlife habitat" (1977, p. 101).

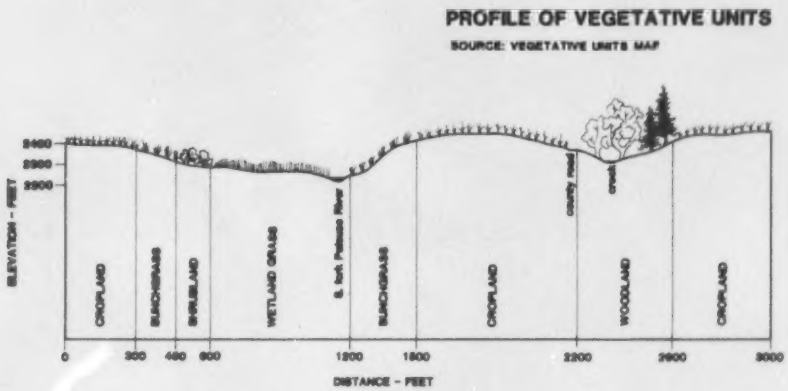
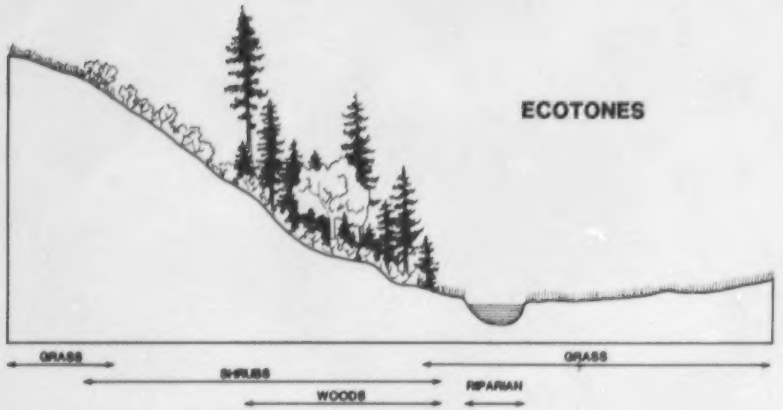


Figure 33 Physiognomic Profiles



Adapted from Brunton et al., 1977

Figure 34 Ecotones and Edge Profiles

Between the units there are boundaries *(Figure 34)*. These edges form ecotones. Ecotones are transitional areas between two ecological communities, generally of greater richness and equitability than either of the communities it separates. Albion has many such areas.

SUMMARY OF VEGETATION INVENTORY ELEMENTS

1. Vegetative units
2. Species list
3. Physiognomic profiles
4. Ecotone and edge profiles

MAJOR SOURCES OF INFORMATION

1. USGS
2. SCS
3. The U.S. Forest Service
4. National, state and local conservation and environmental groups
5. College or university libraries

Wildlife

Broadly, wildlife is considered to be animals which are neither human nor domesticated. Insects, fish, amphibians, birds, and mammals are more mobile than plants. While closely linked to vegetative units for food and shelter, wildlife often uses different areas to reproduce, eat, and sleep. Like vegetation, wildlife has not been exclusively inventoried except where it has some form of commercial value. Because animals are mobile, they are even more difficult to inventory and are even more often ignored by planners than is vegetation.

A starting point again is to compile a list of species in the area. State departments of game are useful sources of information for hunted or fished species. A few state game departments have recently begun to research some non-game species as well, but this is still the exception rather than the rule. Conservation groups and academic facilities are usually the best resources for non-game species.

Once such a list is compiled, which can be a substantial task in itself, it is important to analyze where the species live. One helpful tool is a matrix *(Figure 35)*. For the Albion area, species were listed both with their common and scientific names. The individual species were then matched with the vegetative units they use for breeding, living and eating. It was noted if the species was common, uncommon or rare and what its seasonal occurrence was. Additional remarks for each species were also included. For example, the northwestern white-tail deer (*Odocoileus virginianus*) is a common resident of the area. This species uses a variety of habitats year round and is a vegetarian.

G-GRASS S-SHRUB W-WOODS C-CROP R-RIVER

SPECIES	ANIMAL HABITAT			OCCURRENCE					COMMENTS
	BREEDING	LIVING	EATING	COMMON	UNCOMMON	RARE	MIGRANT	RESIDENT	
American Robin *Turdus migratorius*	W	W	GS	●			●		
Barn Owl *Tyto alba*	W	W	WS	●				●	
Mourning Dove *Zenaida macroura*	GS	GS	GSC	●				●	
Red tailed hawk *Buteo jamaicensis*	W	W	GWS CR		●			●	
Pumpkinseed *Enneacanthus dorsatum*	W	W	W			●		●	
Norway rat *Rattus norvegicus*	GS	GS	GSC	●				●	
Beaver *Castor canadensis*	WR	R	WR		●			●	
White tailed deer *Odocoileus virginianus*	W	WS	WSGC	●				●	

Figure 35 Species-habitat Matrix

Next, it is important to rate the habitats for their relative value (*Figure 36*). This can be done through a series of interviews with game officials, conservation club representatives, land owners and wildlife biologists. Again, this task can be as complex as the planning issue requires. For the issue of agricultural preservation in the Palouse, there is some debate between farmers and state game officials about the value of various habitats. Though farmers enjoy hunting, many consider some game birds and deer pests. Game officials argue habitats need to be preserved for these species.[6]

The value of inventorying wildlife lies in gaining an understanding of an area's ecosystem. Food webs (*Figure 37*) and energy flow diagrams (*Figure 38*) are helpful. These kinds of illustrations are helpful in teaching the people of an area about how the living things use the region.

● VALUABLE
◐ MODERATELY VALUABLE
○ NOT VALUABLE

	GRASSLAND AND PASTURE	SHRUBLAND	CROPLAND	WOODLAND
GAME OFFICIALS	◐	◐	●	◐
CONSERVATIONISTS	◐	●	●	◐
BIOLOGISTS	◐	●	●	◐
HUNTERS	◐	◐	●	◐
LAND OWNERS	◐	◐	○	●

Adapted from Brunton et al., 1977

Figure 36 Habitat Value Map

[6]It should be pointed out that game officials are not always interested in pheasant and deer, *per se*. They are interested in their value as a game species. Hunting license fees pay the cost for the operation of game departments.

Figure 38 Energy Flow

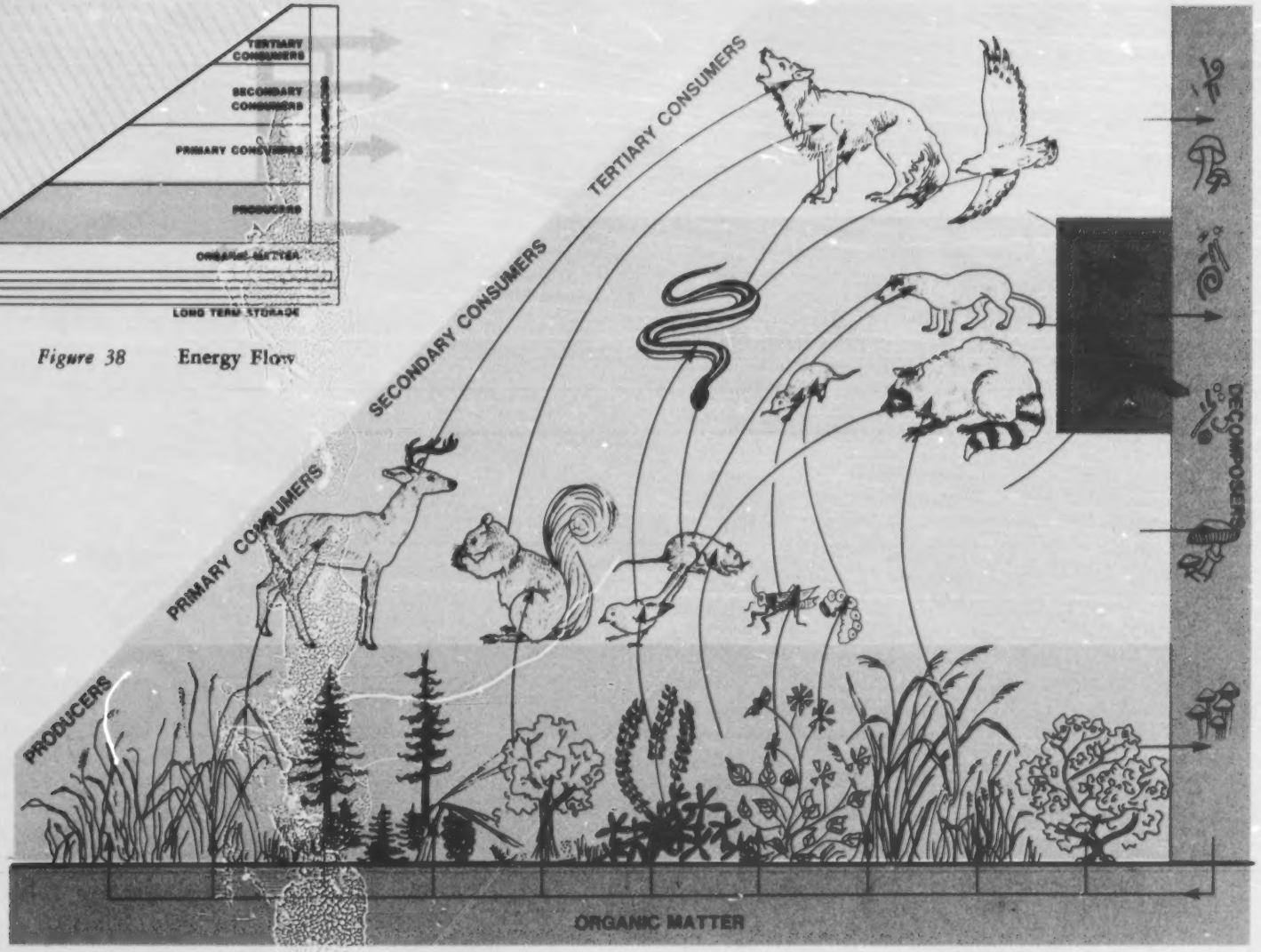


Figure 37 Food Web

SUMMARY OF WILDLIFE INVENTORY ELEMENTS

1. Species list
2. Species-habitat matrix
3. Habitat value map
4. Food web
5. Energy flow

MAJOR SOURCES OF INFORMATION

1. State departments of game and/or fisheries
2. The U.S. Forest Service
3. SCS
4. National, state and local conservation and environmental groups
5. College or university libraries

Existing Land Use and Land Users

"It is because we have studied this living network so superficially and have largely ignored its inconsistencies, that we have evolved a planning process that accounts for only a fragment of the stuff of our lives."

James and Carolyn Robertson (1978)
The Small Towns Book

Existing land use refers to the physical arrangement of space utilized by humans. Almost all the land on the planet is used by people in some way—from the "wilderness" areas of Alaska to the alleyways in Philadelphia. The human ecology, the living network of an area, is much more complex than how land is used. However, land and other resource utilization is a significant component of human ecology. Human impact on the environment is great. So, it is important when inventorying and analyzing an area to recognize how people are using it. It is also important to distinguish between land use and land users.

Land use is fairly simple to discern. A particular piece of land is either used for agriculture or it is not. However, different users may view that piece of land for different purposes. For instance, agricultural land may be used for a variety of crops or pasture; it may be used for hunting or other forms of recreation. Its owners also may see it as an investment (Jackson 1979).

Land use is only the beginning in the establishment of user groups. A particular person in a given location will use many pieces of land. Part of the land used by an individual will be called "home" (residential), another part will be called "work" (commercial or industrial); many parts may be labelled "play" and be tennis courts, restaurants, friends' houses, or roads for either driving or jogging (recreation, commercial, residential, transportation).

A helpful starting point for identifying existing land use and land users is an area's history. Albion was first used by Indians as a campsite *(Figure 39)*. Later, it was developed as a farming community. Today, Albion retains its rural character while serving as a bedroom community for nearby Washington State University. Information about an area's history can be gathered from various sources including interviews with older residents and community libraries.

The next step is to determine land-use categories. As with the vegetation inventory, the USGS Land Use and Land Classification System provides helpful standard categories (Anderson et al. 1976). Again aerial photographs and field checking are necessary to compile a land-use map (*Figure 40*). For many planning projects, this is just the beginning of analyzing land use; property ownership, housing condition and farm management maps also may be required. Some of this information can be gathered from the local tax assessor and the county Soil Conservation Service. For other information, it will be necessary to do field work.

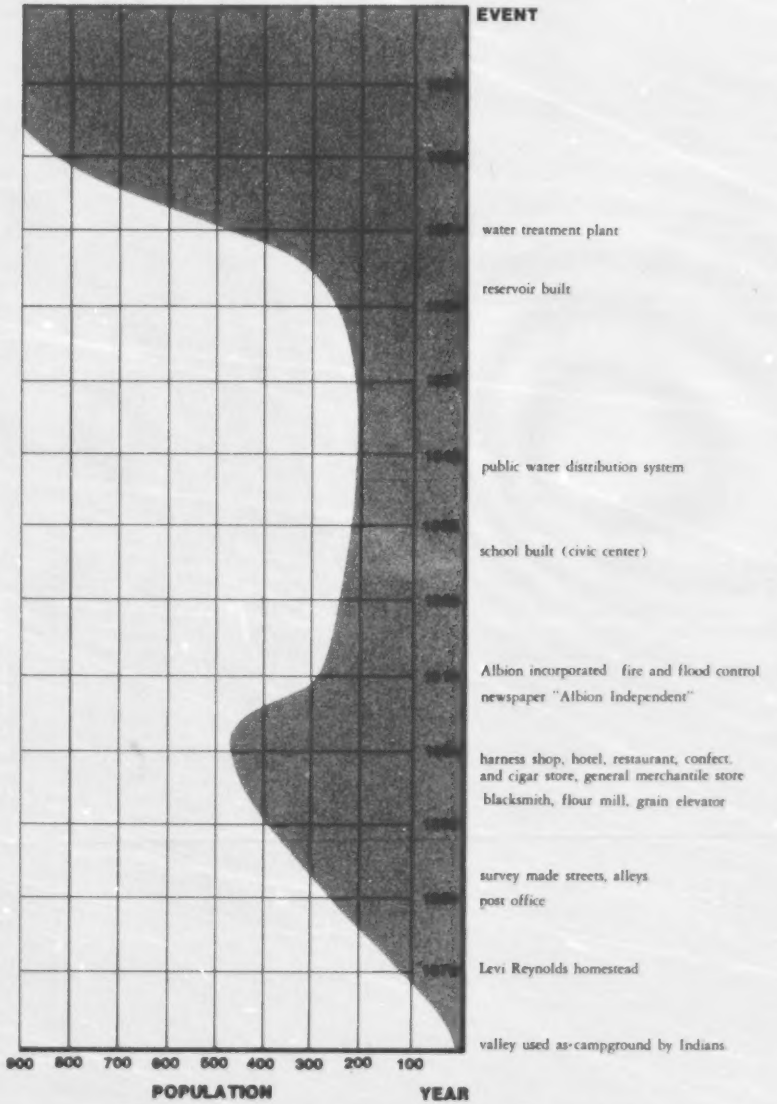

Projected population in the year 2000, 1780.
EVENT
water treatment plant
reservoir built
public water distribution system
school built (civic center)
Albion incorporated fire and flood control
newspaper "Albion Independent"
harness shop, hotel, restaurant, confect.
and cigar store, general merchantile store
blacksmith, flour mill, grain elevator
survey made streets, alleys
post office
Levi Reynolds homestead
valley used as campground by Indians
900 800 700 600 500 400 300 200 100
POPULATION
YEAR
Adapted from Brunton et al., 1977

Figure 39 Historical Development

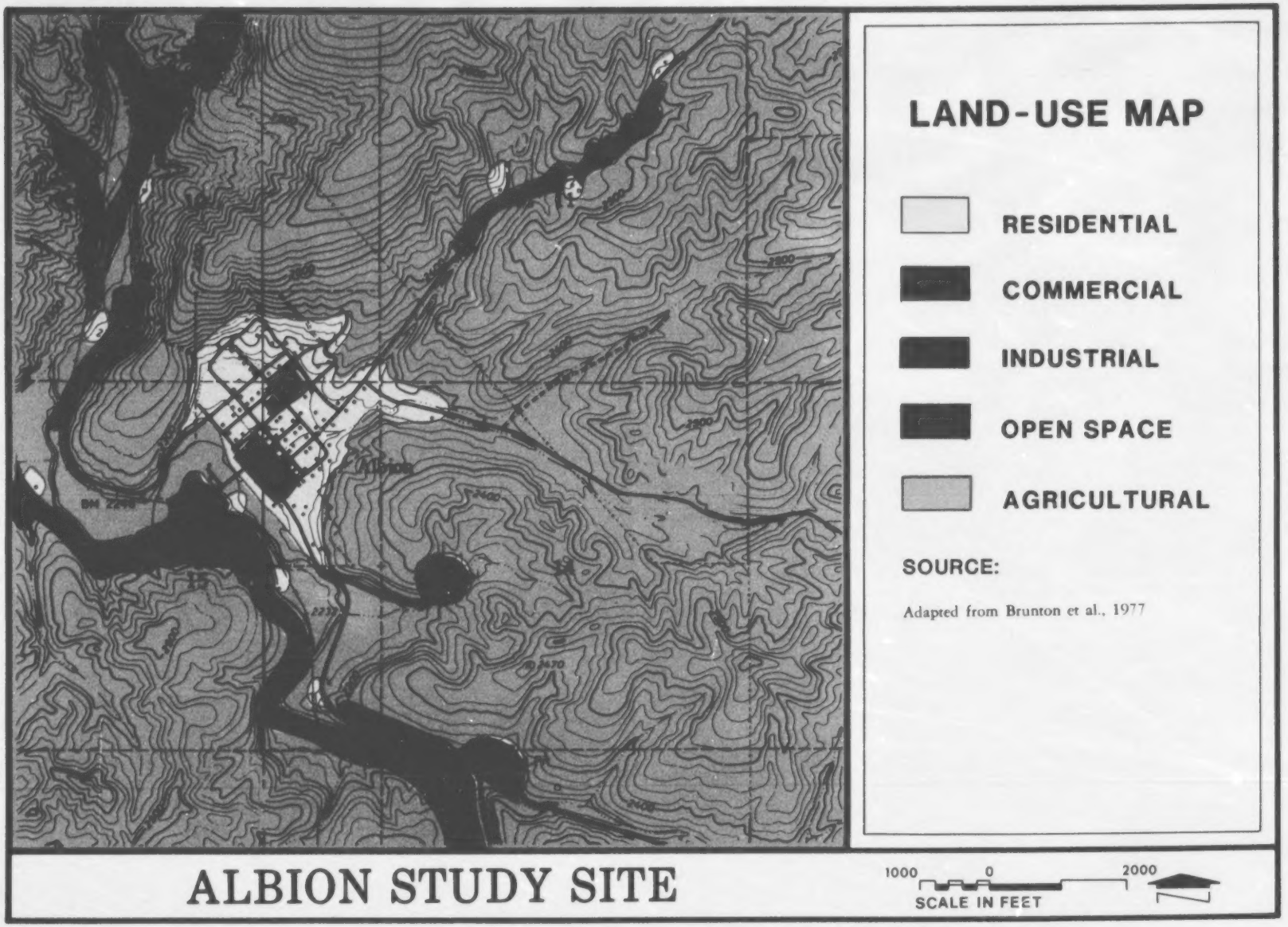


Figure 40 Land-Use Map

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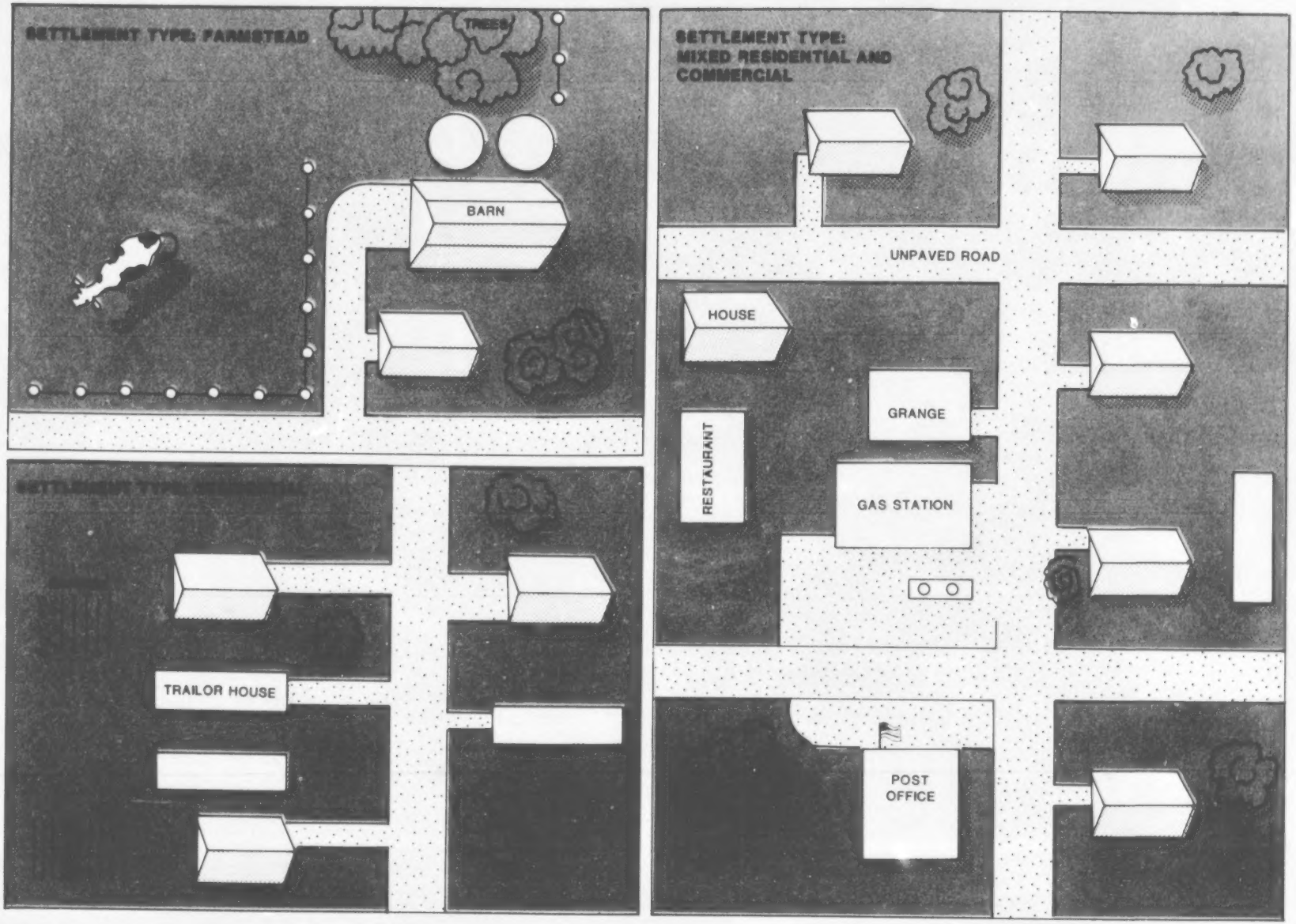


Figure 41 Settlement Patterns

Adapted from Brunton et al., 1977

While census information is a good starting point for understanding who uses the land, it is even better to go out into the community and talk to the people. By talking with people in their homes or places of work and by taking photographs or making sketches, an idea of settlement patterns *(Figure 41)* and concerns or issues can be gained.

Albion's settlement patterns include farmsteads, a mixed mobile home and single family house arrangement, and a mixed residential and commercial pattern. It is often helpful to make a list of the groups who live in an area, then matrix those groups with the settlement types (*Figure 42*). While on one hand, the idea that we belong to a identifiable group seems to run contrary to the American ideals of the melting pot and individualism, on the other hand, our work ethic seems to dictate a certain amount of identity with our work peers. In the Albion area, groups in which people identified themselves included: farmers, students, retirees, university professionals, and laborers.

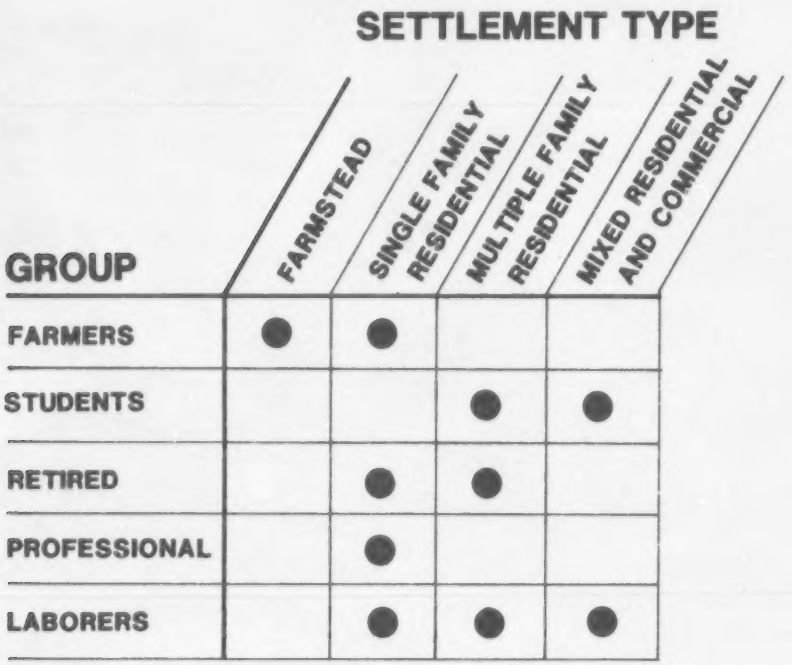
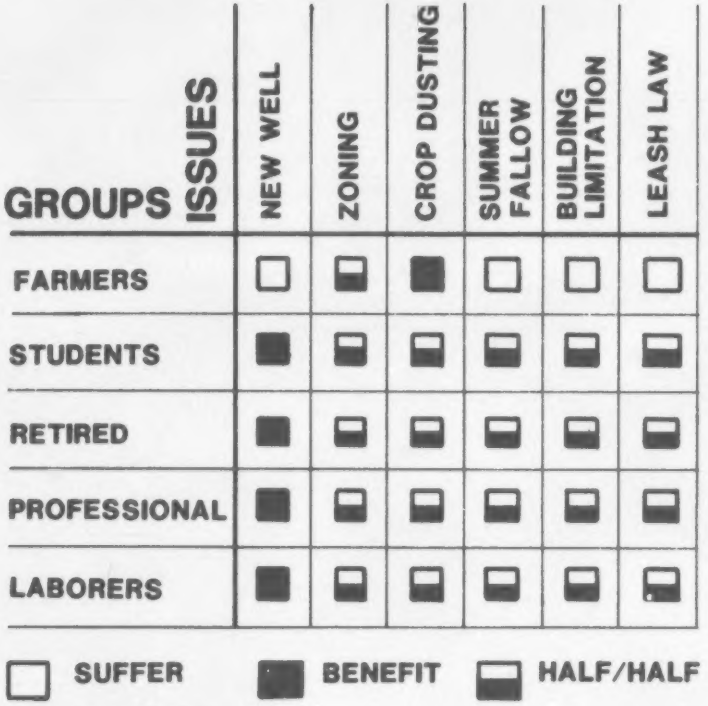


Figure 42 Settlement Pattern—Groups Matrix

By identifying land use and land users and analyzing who uses what, an elementary understanding of an area's social organization can be gained. How these groups are linked to resources and issues is more complex, but this understanding is crucial to planning. By matrixing groups of people with the various issues affecting an area (*Figure 43*), an idea of who suffers and who benefits from a specific concern can be gained.



Adapted from Brunton et al., 1977

Figure 43 Groups-Issues Matrix

SUMMARY OF EXISTING LAND-USE AND LAND-USER ELEMENTS

1. Historical development
2. Existing land use
3. Settlement patterns
4. Land-user groups list
5. Settlement pattern—groups matrix
6. Groups—issues matrix

MAJOR SOURCES OF INFORMATION

1. Individual interviews
2. Interviews with groups and associations
3. Local newspapers and libraries
4. Tax assessors
5. The U.S. Census
6. SCS
7. USGS
8. College and university libraries

Analysis and Synthesis of Inventory Information

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."

John Muir

If it is true that everything is connected to everything else, then to be helpful for planning, those connections need to be made explicit. The first step in making those connections is to analyze how the inventory elements relate to each other. A useful guide is to identify bivariate relationships of all possible pairs of landscape elements (*Figure 44*).

In the Palouse, geology influences elevation and slope (1) in several ways. The old crystalline rocks are at the highest elevations in the Albion area. The sloping Palouse hills are a result of deposition, while the basalt has been exposed through erosion. Those exposed basalt outcrops result in steep slopes. In lower elevations, there are alluvial deposits along the streams.

	GEOLOGY	PHYSIOGRAPHY	CLIMATE	SOILS	GROUNDWATER	SURFACE WATER	VEGETATION	WILDLIFE	LAND USE
GEOLOGY		1	2	3	4	5	6	7	8
PHYSIOGRAPHY			9	10	11	12	13	14	15
CLIMATE				16	17	18	19	20	21
SOILS					22	23	24	25	26
GROUNDWATER						27	28	29	30
SURFACE WATER							31	32	33
VEGETATION								34	35
WILDLIFE									36
LAND USE									

Figure 44 Bivarite Relationships

Locally in the Albion area, geology influences microclimate, and there is also a regional influence (2). The microclimate is affected both by the Palouse hills and the basalt valleys. The north sides of the hills are cooler than the south sides. Fog pockets hug the valley areas. The macroclimate is influenced by the low-lying Columbia Basin to the west and the higher mountains to the east and south.

Geologic parent material is an important ingredient to the soil forming process (3). The most important parent material in the Palouse is the wind deposited loess. Through time, as erosion from the hills occurred, these soils became the parent material for alluvial soils. Basalt and crystalline rock also add parent material to soils (Brunton et al. 1977).

Certain rock formations make better aquifers than others (4). Clay areas between basalt layers hold water. Fissures in the crystalline rock provide some good local water supply. In addition to groundwater, surface water is also affected by geology (5). Ephemeral streams occur mostly in the eolian deposits; intermittent streams occur where the soil is thinner and the basalt closer to the surface, and the rivers and streams that flow all year round occur where the basalt has been cut away and alluvium has been deposited.

Geology influences vegetation and wildlife (6, 7) through its effect on physiography, climate and soils. The eolian deposits support primarily grass and shrubland. Where basalt is closer to the surface, there is more woodland and shrubs such as hawthorn and roses. The alluvial areas support marsh grasses, shrubs, and some willows. The effect of geology on wildlife comes not only through the cumulative influence, but also by providing burrowing habitats (in the eolian deposits) and cliff habitats (in the basalt outcrops).

Land use is influenced in several ways by geology (8). The eolian deposits provide the parent material for the fertile Palouse soils. These areas are used extensively for farming. The town of Albion is located over the crystalline formation. There are several dirt roads in Albion supported by this crystalline base.

The influence of physiography on climate (9) is similar to that of geology. Physiography influences soils (10) in several ways. Deeper soils occur on gentler slopes while the shallower soils occur on steeper slopes which are usually north-facing.

Physiography is related to groundwater through recharge (11). Aquifers are recharged in the higher, gently sloped areas and discharged at lower elevations. Near Albion, it is common after a rainfall to see water being discharged between the basalt layers along the valley areas. Surface water flows at different levels in relationship to elevation and slopes (12). Ephemeral streams occur in the highest elevations, on the steepest slopes. Intermittent streams occur at lower

elevations; they have eroded more distinct channels into the more gentle slopes. In the lowest and flatest area near Albion flows the south fork of the Palouse River.

Physiography exerts a strong influence on vegetation (13). Steeper, north facing slopes and valleys support the majority of the Albion area's woody vegetation. The lowlands along the Palouse River support wetland grasses, some shrubs and a few willow trees. The remaining areas of native grasses and herbaceous plants are in the higher elevations. The dominant vegetation would be grasses if the area were not so extensively cultivated. Again, wildlife is related to physiography through the habitats provided by vegetation (14).

Physiography has a strong influence on land use (15). The sloping Palouse hills are extensively cultivated. Combines and other farm machinery have been specially adapted to these slopes. The town of Albion is sited in a flat area, while most of the homes in the area are near the base of the Palouse hills. The placement of roads and utility lines is influenced by the area's physiography.

Climate is related to soil development through a number of processes (16). Frost action, precipitation and wind play major roles in soil development, affecting soil texture and drainage characteristics. Erosion in the area is influenced by a number of soil-climate relationships. Palouse soils are impermeable, thus, increasing surface runoff. Serious erosion problems result in the winter when snow collects on the hillsides. Intermittent warm Chinook winds can quickly melt the snow causing water to wash the soil down the hillside.

Climate is related to hydrology in the obvious way (17, 18). Precipitation is the source of groundwater and surface water. Water that does not infiltrate into the ground is contained in the area's ponds, streams and rivers until it flows out of the area or evaporates.

Vegetation is also greatly affected by climate (19). Water and solar radiation are the key influences on plant development. Likewise, climate influences wildlife (20) through precipitation and solar radiation. Reproduction, migration, hibernation and feeding are all influenced by the variation in climate through the seasons.

The major land use in the area is dependent on climate (21). Farmers probably talk as much about the weather as they do the price of wheat. Climate also influences housing through such things as heating bills and road access during snow storms.

Soils influence the amount of water that flows through the ground to feed aquifers (22). Water flowing across the land surface is a major factor in erosion and drainage (23). Water also deposits material which develops into alluvial soils.

Soil characteristics such as texture, pH level and cation exchange capacity are interrelated to vegetation (24). Conifers, such as the area's Ponderosa pine, help to create acidic soils. As vegetation dies and decomposes, it creates the humus layer of the soil. Soil in turn helps determine what will or will not grow in an area. Wildlife uses soil as a habitat (25). Again, it is hard to separate the influence of soil on vegetation from wildlife.

Agriculture is dependent on good soils (26). Crops are plants and as such, have the same relationship with soil as other vegetation. Soils also influence lawns and shrubs around housing, the septic tanks used by many rural residents, and Albion's sewage treatment plant.

Groundwater recharge influences stream flow (27). It also provides the supply of water available for vegetation, wildlife, and humans (28, 29, 30). Surface water is related again to water supply for plants, animals and people (31, 32, 33). It also provides a habitat for certain types of plant and animal life. Surface water is of concern to agriculture because of erosion and to other land uses because of flooding.

The interrelationship between vegetation and wildlife is very close (34). Vegetation provides food and shelter for wildlife. Vegetation influences both the economics and aesthetics of various land uses (35). Some types of vegetation conflict with crops and thus require management by farmers. This requires time and money. Other forms of vegetation, such as trees, provide energy-efficient homesites that make pleasant places to live. Wildlife can be pests and friends to the area's people (36). Many species feed on the crops, which makes them pests. Some animals are predators to these pests and provide the natural controls of pest populations. Other animals provide enjoyment for Albion residents through such activities as bird watching and hunting.

This information can be synthesized in numerous ways. Maps can be physically overlaid to see how, for instance, slope is related to vegetation. Inventory information can be digitized, put in a computer program and relationships explored closer. The various elements of Albion are related to one another both spatially and through the natural processes.

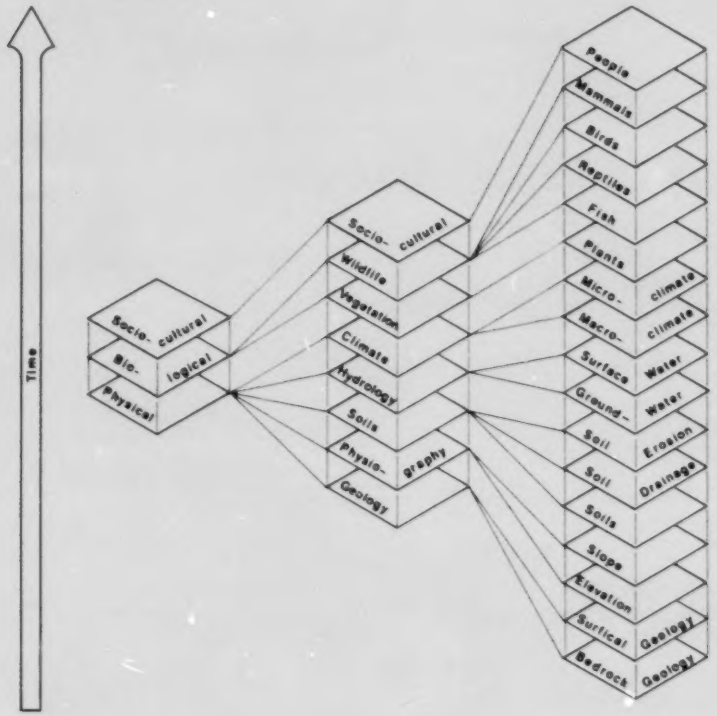
All these factors are evolving. Some processes occur at a slower rate than others. For instance, the geologic changes occur over a much longer period than the human changes. The crystalline rocks of the Albion area are more permanent than the college students who live in the area. The weathering of basalt rock takes longer than language changes.

Addressing the relationships between landscape elements, Berger observed:

> *"those elements which are generally least affected by human activity are those whose evolution or rate of change are slow—geology, physiography, climate and, to some extent, soils. Groundwater, surface water and their channels, vege-*

tation and wildlife are more easily disturbed. Although it is a simplistic approach, the landscape may be viewed as having a relatively unchanged physiographic form comprised of geologic units" (1977, p.121).

Layer-cake models help to gain a perspective of how these elements interrelate across the landscape (*Figure 45*). These layer-cake models of Albion help to gain an understanding of how everything is related to everything else.



ADAPTED FROM WALLACE, McHARG, ROBERTS, AND TODD 1971-1974.

Figure 45 Layer-Cake Model

Land Classification for Agricultural Preservation

"The history of every nation is eventually written in the way in which it cares for its soil."

Franklin Delano Roosevelt

Efforts to inventory the land of Whitman County were started in the fall of 1977 by the Department of Horticulture and Landscape Architecture, Washington State University, in cooperation with the Whitman County Regional Planning Council. Landscape architecture, regional planning and environmental science students completed ecological inventories of five four-square mile study sites. These inventories included the communities of Albion, Colton, Johnson, Palouse, and South Pullman, Washington. The inventories included such data as geology, physiography, groundwater hydrology, surface water hydrology, soils, climate, vegetation, wildlife, and existing land uses as

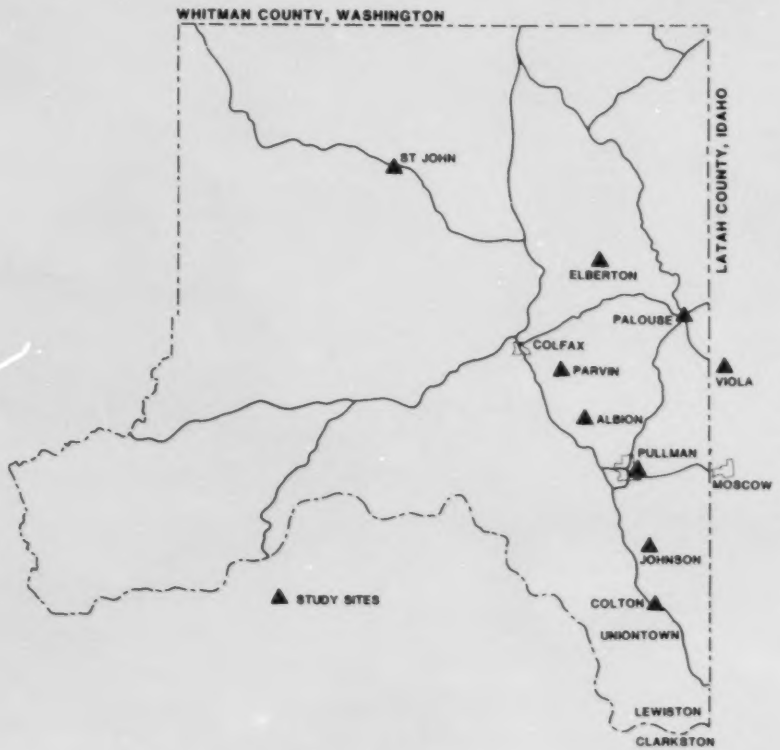


Figure 46 Ecological Planning Study Sites

have been outlined. Four additional inventories were conducted by students in the fall of 1978. These inventories included the communities of Elberton, Parvin, and St. John, Washington, in addition to Viola, Idaho (*Figure 46*).

It was during this period, that the Whitman County Board of Commissioners revised its comprehensive plan. High priority goals included the preservation of agricultural lands and the family farm and the allowance of some, low-density rural housing in the county.

Since detailed land inventory information did not exist for the county (for instance, there was no published soil survey), the commissioners decided it would be best not to define "prime or good" agricultural land. Farmers knew it was good because it produced a higher yield of wheat per acre than any other county in the nation. The commissioners decided instead to encourage very low density rural housing on marginal land. Guidelines for the siting of such housing were outlined in the comprehensive plan.

These guidelines were criticized by some local builders and developers as being too tight. They claimed that there was little or no land which met the guidelines outlined by the commissioners. A study team was organized to complete a rural housing feasibility study to determine if, in fact, there was land available that met the planning standards. A 150-square mile demonstration site near the cities of Pullman, Washington, and Moscow, Idaho, was chosen and an ecological inventory conducted *(Figure 47)*. This demonstration site encompassed Albion. Information collected and mapped by the study team for the demonstration area included: geology, elevation, steep slopes and basalt outcrops, soil types, wildlife habitat, transportation and property ownership. Estimates were made on the amounts of marginal land and amount of land that met the commissioners' criteria for suitable rural housing (Steiner and Theilacker 1979).

During the course of this feasibility study, a grant was secured from the Office of Environmental Education, U.S. Department of Health, Education and Welfare, to look at the issue of agricultural preservation in greater detail. A study team was formed to carry out this investigation, comprised of a project director, a research assistant, a graphics coordinator, and a student summer intern. This team worked closely with the staff of the regional planning council. To assist with this investigation, a Technical Advisory Committee was formed. This committee was comprised of farmers, soil scientists, local elected and appointed officials, and university professors. These people first reviewed the inventory information that had been collected to date. Then they assisted the study team with two tasks: developing a land classification system for agricultural preservation and identifying planning tools to implement the county policy.

Additional environmental data about the demonstration area were collected including natural vegetation, existing cover vegetation, and slope. Working closely with the Soil Conservation Service, maps were produced of soil capability, productivity by soil type, and prime and unique lands. The Technical Advisory Committee critiqued applicability of each for use as a land classification system for agricultural preservation in Whitman County. The prior inventory information completed for the rural housing study was helpful in this review process.

The Soil Capability Classification System was developed by the

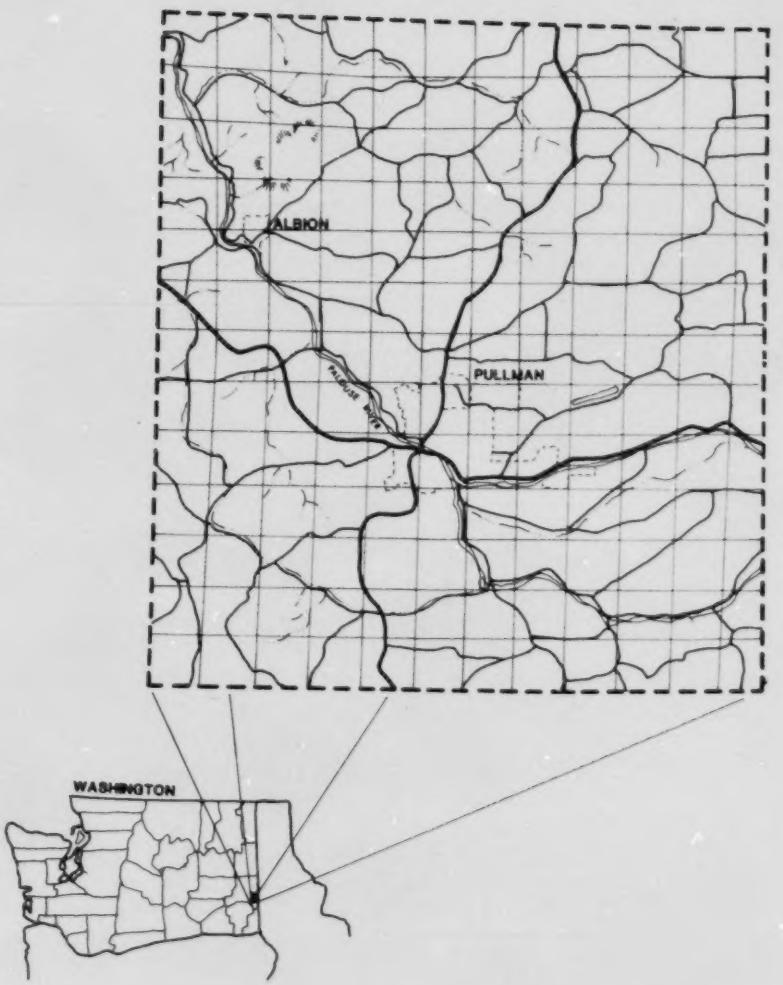


Figure 47 Pullman Demonstration Area

Soil Conservation Service. It is probably the best known and most widely used land classification system. Soil types are placed in Class I through VII, depending on limitations and risks of soil damage. Soils in the first four classes are generally best suited for cultivation, pasture, and forest use. Class I has virtually no limitation for cultivation, Class II some limitations, Class III severe limitations, and Class IV very severe limitations. Classes V through VII have various other limitations for cultivation. Recommended uses include pasture, range, woodland, wildlife, and recreation. However, some of these soils are capable of producing certain crops. Soils in Class VIII are badlands, rock outcrops, sandy beaches, and other nearly barren lands (Reganold and Singer 1978).

Limitations and hazards are also considered in the Capability Classification System. The four subclasses used are e—erosion hazard, w—wetness, s—rooting zone limitations, and c—climate limitations. Finally, capability units are determined. The capability unit contains soils that have about the same response to management practices of common cultivated plants (Reganold and Singer 1978).

Adapting soil capability for farmlands preservation was criticized by members of the Technical Advisory Committee for several reasons. One reason was that the system was not developed for the purpose of identifying land to preserve for agricultural use. Much of Whitman County's soils are greater than Class III because of the rolling topography with steep slopes, and several farmers pointed out that they get high yields on Class IV and Class V soils. So any hierarchy of protection based on capability classes would not necessarily secure all productive land.

One system of land classification familiar to local farmers is the productivity index rating system used by the county assessor for taxing purposes as part of the Washington State Open Taxation Space Program. In this system, soil types are rated numerically from 1 to 100 based on their ability to produce wheat. For example, if a farmer can expect a yield of 85 bushels of wheat per acre, it would receive an index rating of 95. If 20 bushels of wheat per acre could be expected, it would receive an index rating of 12. The criticisms levied against using this system for agricultural preservation were that it relies too heavily on wheat and that, in the Palouse, productivity is not necessarily an indication of profit.

The Technical Advisory Committee identified slope, soil depth and rainfall as the three most important factors for agricultural production in Whitman County. Soil scientists involved on the Technical Advisory Committee indicated that the land classification system developed by the Soil Conservation Service for the distinct purpose of identifying prime farmland takes into account these three factors. This is the Prime and Unique Land Classification System. Criteria for this system has been developed nationally and for the state of Washington, but not mapped for Whitman County. It was decided to map the demonstration area using this criteria, but since the demonstration area fell into the highest rainfall area of the county, the local soil scientists volunteered to map several selected sites in other sections of the county. Rainfall in Whitman County ranges from 11 inches of annual precipitation on its western boundary to 22 inches on its eastern boundary. This dramatic range in rainfall affects both farming practices and the Prime and Unique Land Classification System. The state SCS was encouraged to complete a prime and unique lands map for use in Whitman County. The technical advisory committee discussions will be used as a resource for this map.

The Soil Conservation Service has defined prime farmland as that best suited for producing food, feed, forage, fiber and oilseed crops, and also available for these uses. Prime land has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods. An example of a soil type that qualifies as prime farmland is Palouse silt loam, 0 to 7 percent slope (U.S. Department of Agriculture 1977).

The secondary category in this system is unique farmland. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the "special combination" of soil quality, location, growing season and moisture supply needed to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods. Annually-cropped western white wheat and dry peas in areas of 15 to 23 inches mean annual precipitation and lentils and malting barley in areas of 20 to 23 inches mean annual precipitation was considered unique by the state conservationist (U.S. Department of Agriculture 1977).

There are two remaining categories in this system: additional farmland of statewide importance and additional farmland of local importance. These are farmlands that meet state or local criteria for importance. In many areas, important agricultural activities occur on soils that do not fit the national definitions of prime and unique. Criteria for identifying areas of statewide and local importance are in the process of being considered. The remaining lands are considered marginal for cultivation although a farmer once remarked that there was no such thing as marginal soil, only marginal farmers.

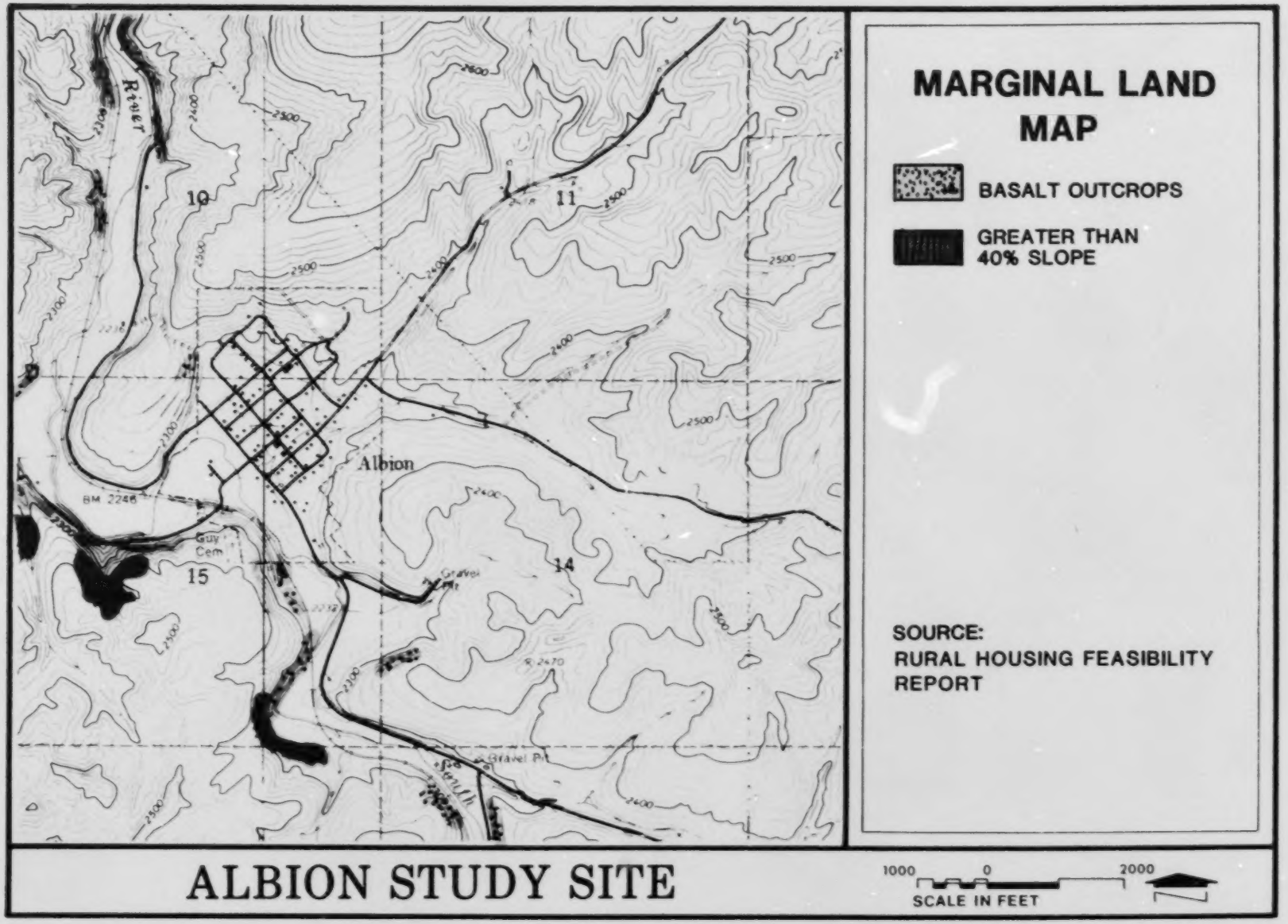


Figure 48 Marginal Land Map

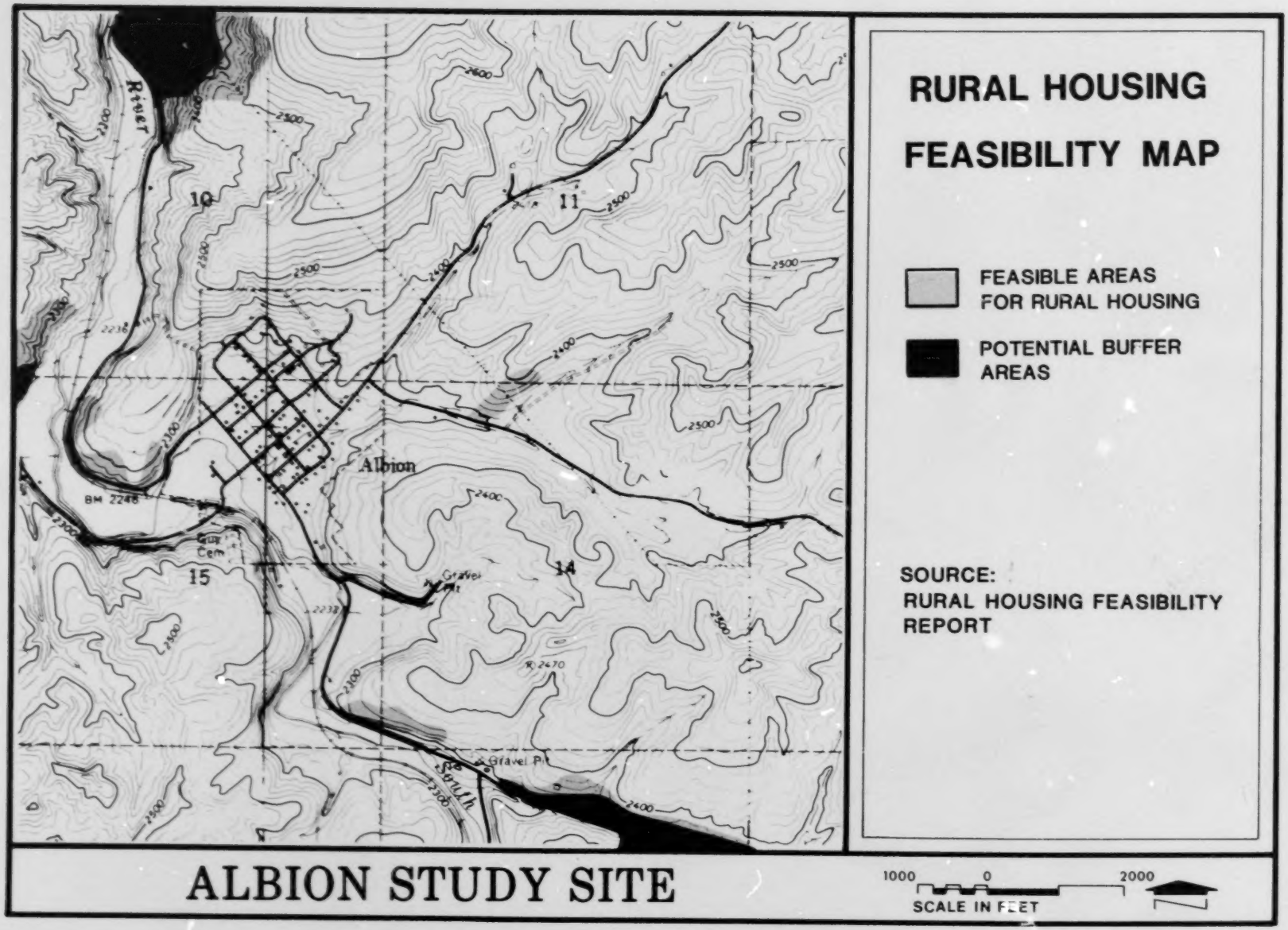


Figure 49 Feasible Areas for Rural Housing Map

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The amount of prime and unique lands varies among the three rainfall areas in Whitman County. In the high rainfall area, which includes the 150-square-mile demonstration area, 4 percent of the land is considered prime, while 93 percent is unique. In the medium rainfall area, 15 percent of the land is considered prime, while 82 percent is unique. The low rainfall area contains no land considered either prime or unique.

When the study team and the Technical Advisory Committee were formed, it was hoped that a land classification system with neat gradations of suitability for agriculture and housing could be derived. This did not occur. Each system that was explored presented the same conclusion—the great majority of the land in the demonstration area was excellent for dryland farming. The SCS Prime and Unique Classification System offers the best example. Using this system, 97 percent of the land is considered prime or unique. The reason why 93 percent is unique and not prime is because of the area's steep slopes. This leaves only 3 percent that is neither prime nor unique land.

While the classification system supports what can easily be observed by driving through the area—that this is excellent farmland—the dilemma remains that some land ought to be available for rural housing for farm workers and families and those seeking a rural living situation. Additionally, there is concern that if all the area's land is tied up for agricultural use, opportunities for growth in the housing supply are reduced which affects those with low and fixed incomes most.

Returning to the rural housing study, it was found that there were 12,443 acres of marginal land in the 150-square mile demonstration area. Suitability analyses were completed on substantial portions of this demonstration. The analyses indicated that there was enough acreage available for rural housing which met rigid environmentally sensitive performance criteria. *Figures 48 and 49* illustrate the marginal land and areas feasible for rural housing near Albion.

Those rural housing areas were on thin soils near basalt outcrops and in valleys outside floodplains *(Figure 50)*. An environmental checklist was developed to provide performance standards to be considered in the siting of rural housing. It was proposed that these performance standards be reviewed on a case-by-case basis by a team comprised of the county planner, the district soil conservationist, and the county health official.

Concern about severely limiting the housing supply has several potential resolutions. Urban expansion, in the form of housing, commerce and industry can be permitted, if annexed to existing towns. This makes the cost of services less expensive and less disruptive to farming. In Whitman County there are numerous small towns and villages that have experienced a decline in population over the past several decades

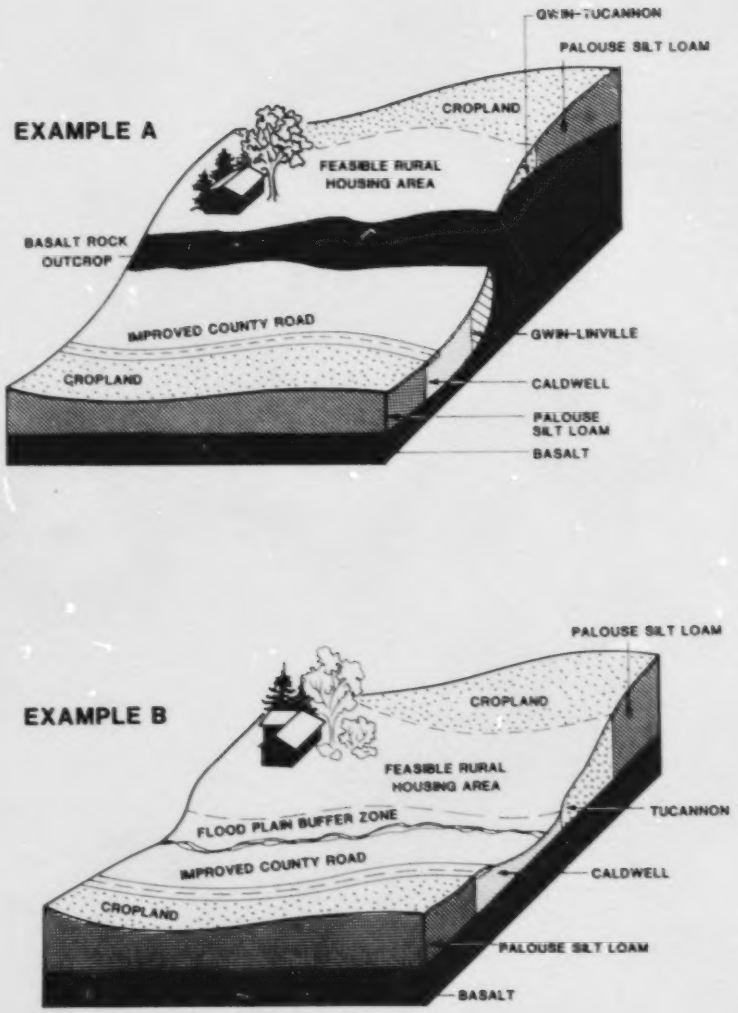

Figure 50 Sample Siting of Rural Housing

due to numerous factors. Agricultural services have become more centralized, as have educational and commercial facilities. Newer highways have bypassed these small towns. Some of these existing communities, such as Albion, could absorb some residential, commercial and industrial growth without impacting farmland.

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"The planner is active: a radical agent of change. He or she is not, as are so many of today's professionals, a creature of divided loyalty, one who owes as much or more to the profession as to the people. Instead, the job is to facilitate social experimentation by the people. The radical planner is a non-professional, no longer one with a property right entitled "planning," but rather an educator and at the same time a student of the ecological ethic as revealed in the consciousness of the people. Such an individual strives for self-actualization of one's-self and of the others with whom one lives. Finally he or she is not apart from the people: the planner is one of us, or all of us."

Stephen Grabow and Allan Heskin (1973)

After many months or years of work researching the biophysical environment of a place and then coloring maps or other visual aids to convey that knowledge, it can be a discouraging experience to make a presentation of that collected wisdom to a group of people only to have an unimpressed farmer remark, "Well, hell, what else is new? We've known that all along."

Herbert Gans once commented that planners are more like tourists than residents. This is because, while many planners are adept at inventory and analysis or are competent administrators of local ozning ordinances and federal grants, they seldom bother to be students of that "ecological ethic as revealed in the consciousness of the people."

Inventory and analysis information, like technical reports, for comprehensive plans are only like scaffolding. They are necessary for construction but should be removed when the building is complete and open to its users. In agricultural regions, people are cognizant of the "environment"—it is how they earn their living. Still, it is necessary for planners to understand the physical, biological and human processes of an area. Then it is necessary to link that knowledge to decision making.

In Whitman County, various approaches to organizing the community around the issue of protecting farmland were attempted and will continue to be attempted. Most have been geared to long-term education, because, while the county's current leadership is progressive on the issue of agricultural land preservation, political winds could shift, and all the efforts of the current leadership could be scuttled at the cost of many acres of productive farmland. Thus the education of the community is essential so that a constituency is developed which is well informed and articulate. To achieve this goal of community education, the following organizing efforts were undertaken: the Technical Advisory Committee was organized; a television documentary was produced by the local public television station; an audiovisual presentation was produced that can be shown at various community functions; trips were organized to various regions of the country for local elected officials and farmers; several publications were produced; an agricultural planning booth was exhibited at the annual county fair; and finally, ongoing agricultural preservation workshops are being held with various community groups.

The Technical Advisory Committee

The Agricultural Preservation Technical Advisory Committee was organized in September, 1978 and met monthly except during the summer until December, 1979. These meetings were arranged around the temporal schedule of the farmers. The committee fulfilled two functions: 1) it brought together diverse segments of the community which did not have another opportunity to interact, and 2) it acted as a feedback mechanism to the efforts which were being made by the study team researchers. Some of this feedback role was discussed in the previous section but will be looked at a bit closer here.

Washington State University is a land-grant institution. The land-grant university system was established by the Morrill Act of 1862. This federal legislation created free, publicly funded colleges of agriculture and engineering for rural and urban working people. Federal research funds are directed to land-grant universities and their state experiment stations through the USDA's Cooperative State Research Service. In 1977, $415 million were allocated out of federal funds for agricultural research (Belden et al., no date).

Unfortunately, all the interaction that should take place between farmers and land-grant university researchers like those at Washington State University does not occur. University personnel become deeply involved in their experiments, writing papers or grants, and teaching. Farmers are equally involved with their cultivating, planting and harvesting. This is not to suggest that important discoveries concerning agricultural production have not been made by land-grant institutions. Much important work has been done by land-grant researchers. However, the ivory tower syndrome does persist and not nearly enough interaction occurs between scientists and the community.[7]

The Technical Advisory Committee was comprised of individuals with the following occupations and affiliations. There were five wheat farmers—three were also conservation district chairmen, one was also the chairman of the planning commission, and one was president of the local Farm Bureau. There were three Washington State University professors—a soil scientist, an ecologist, and a landscape architect. There were two individuals from Cooperative Extension—an agricultural economist, who also was the state program leader for community resource development, and the former county agent, who was coordinating the county's water quality program. There were also two planning professors—one from the University of Idaho and one from Eastern Washington University (located 60 miles north of Pullman). The City of Pullman was represented by the city administrator and the chairman of the planning commission (she was also on the staff at Washington State University). Albion's planning commission chairman also participated. From county agencies ,the director of the county SCS, the director of the Whitman County Regional Planning Council, the county prosecutor, and the director of the port were involved. A high school health teacher and a television film producer rounded out the Technical Advisory Committee.

The members of the study team helped organize and participated in the Committee meetings. All of these 24 individuals attended at least two of the monthly meetings. The average attendance was 17. In addition, county commissioners, county planning commissioners, the local press, SCS staff, students and regional planning staff attended some of the meetings.

Not every county that would like to develop a program to preserve its farmland is fortunate enough to have a land-grant university nearby, however, there are certain to be other resource people available to organize a technical advisory committee. First, there will be an extension agent from the land-grant university's cooperative extension service in the county. This agent will have access to the university's resources. Second, it is likely that somewhere in the region there will be a college or university. Departments of planning, landscape architecture, soils, ecology, geography, law, and economics can all be helpful. Third, there will be a SCS office and there may be organized conservation districts. Finally, local planning commissions, farm organizations, elected and appointed officials, and interested citizens are all helpful.

One word of caution should be offered. It is important to try to involve individuals with both an interest in the issue and the time to attend meetings. For example, an individual, who was an agricultural economist, was asked to participate in the Technical Advisory Committee. This individual had a long standing and sincere interest in the issue, however, he had just been promoted to a new position with added responsibilities that required a great deal of travel. As a result, he was not able to participate as much as would have been liked. Though another agricultural economist was able to attend one meeting in the other's absence, the talents of an agricultural economist were sorely missed.

Many of those who became involved with the Technical Advisory Committee had high expectations about what it would accomplish. Some felt that a concrete scheme for preserving farmlands would arise. Most of these individuals were from the university. The farmers were more cautious. They wanted to know more about the issue and, more importantly, how it could affect their lives. Still the two goals of bringing people together and of creating a feedback mechanism were accomplished.

One example of how the Technical Advisory Committee provided feedback, trying to develop a land classification system, has already been provided. Another example of how this feedback role developed and how people were brought together is the discussions of the Committee concerning natural vegetation. Since the eminent ecologist Rexford Daubenmire had spent his career in the Palouse, it was felt that perhaps his work may provide the key to some land management technique for the area (1970).

A considerable amount of time was spent by the ecologist and

[7]For a critical review of land-grant research and some of the deleterious effects of that research on the farming community, see *New Directions in Farm, Land and Food Policies, A Time for State and Local Action*, published by the Conference on Alternative State and Local Policies.

the landscape architect on the Technical Advisory Committee and the project's graphics coordinator (who had earned a degree in landscape architecture) researching this possibility. There was a certain amount of optimism because Daubenmire had developed a system for forest management used by the Forest Service. After reviewing much of Daubenmire's research and discussing the possibilities, the ecologist presented his ideas to the Technical Advisory Committee.

A lively debate ensued. Without going into details, the debate revealed two sets of values. The first, university people tended to view the land for its aesthetic and/or scientific value; the second, farmers tended to view the land as a commodity upon which they depended for their livelihood.

This difference between how urban and rural people perceive the environment has also been observed by J. B. Jackson (1967) and Donald Appleyard (1979). In Appleyard's words, "farmers, miners, lumbermen and foresters see nature as a thing to be used. A good landscape for them is one that functions well, no matter what it looks like. But an urban dweller fails to see this. The result is conflict" (1976, p. 151).

One outcome of the debate was that some of each group's stereotypes about the other were confirmed. Some mutual ground was discovered however, and considerable learning took place. (I feel those from the university learned more from the farmers, than vice versa.) One conclusion was that, in a sense, the farmers were already using Daubenmire's vegetation classification system. Those areas he identified as natural grassland were used for wheat, a grass.

MAJOR SOURCES OF INFORMATION

1. State land-grant university
2. County cooperative extension agent
3. Local college, university or community college—departments of planning, landscape architecture, soils, ecology, geography, law, and economics
4. County SCS and conservation districts
5. Local planning commissions
6. Farm groups and organizations
7. Elected and appointed officials
8. Local citizens groups and organizations

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Producing a Television Documentary and an Audiovisual Presentation

With the receipt of the Environmental Education grant, financing was made possible to produce a television documentary and an audiovisual presentation on the county's efforts to preserve its agricultural land. The station responsible for this documentary was KWSU, the public broadcaster of Washington State University. Instead of filming the community from a distance, KWSU became intimately involved with the agricultural preservation effort. The KWSU producer became a member of the Technical Advisory Committee. Not only did he attend the meetings, but he also became an active participant.

Before starting to film, many other productions from various parts of the country were reviewed. Several were quite good and a few were shown at Technical Advisory Committee meetings. While several were good at presenting the issue, none concentrated on how a local government could approach farmlands preservation. So, it was decided to document how the local government of Whitman County approached this issue.

Much of the film involved interviewing local people and soliciting their opinions concerning the issue. Something else was sought. It was felt that it was necessary to convey a feeling for the land and what it meant to the area's residents. As a result both the physical and social structures of the area were explored. A film crew also accompanied local officials on their visits to other regions attempting agricultural preservation programs. In this way, the various alternatives for agricultural preservation could be presented visually to a wider audience. Finally, members of the Technical Advisory Committee, the county commission and planning commission were given the opportunity to view a work print of the film to see if it did indeed reflect their view. Their editorial suggestions were then incorporated into the final version of the film.[8]

In addition to the film, a short audiovisual presentation was produced. This presentation capsulized the planning process into a 5-minute program which could be used at community functions where the longer 40-minute film could not fit the agenda. The audiovisual presentation included no complicated technical information or jargon. Services of the local public radio station and local photographers were used.

[8]This film is titled "The Only Essential Industry: Farmland Preservation in Whitman County, Washington." More information about this film may be obtained from the Marketing Division, Instructional Media Services, Washington State University, Pullman Washington 99164, (509) 335-7301.

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The script for that audiovisual presentation is as follows:

This is the Palouse Country. The Palouse is a narrow strip of land in eastern Washington and northern Idaho. Because of the luck of nature and the hard work of the people who till this land, the Palouse is one of the richest grain-producing regions in the nation.

Good agricultural land is a blessing. It is the result of millions of years of work by nature. Good agricultural land is the result of the right combination of the soil-forming processes of the geologic parent material, climate and biotic formation. Rich agricultural land is a valuable resource which is now being threatened across the nation. Millions of acres of prime farmland are lost each year to urbanization, damming, highways, power lines and stripmining. This loss is particularly tragic in light of the international hunger problem and the lack of good farmland worldwide.

Farmland is also threatened here, in Whitman County, where growth pressures from the cities of Pullman and Moscow have threatened agriculture.

The people of Whitman County have faced this threat through the democratic process of local government. Both elected and appointed officials are working hard to retain the agricultural way of life here.

Whitman County officials have visited other regions across the nation to see what other local officials are doing to preserve farmland in their areas. A film crew from Washington State University accompanied these officials to record the events as they happened.

The first stop was Black Hawk County, Iowa. Here, where corn is the major cash crop, local officials have developed a corn suitability rating system for identifying the productive lands that are of primary importance to preserving their agricultural way of life.

The state of Wisconsin is a leader in agricultural land preservation, but the *initiative* for its state-wide program came from the concern of local officials in Walworth County. In Wisconsin, local governments oversee state income-tax credit programs for farmers who voluntarily include their land in exclusively agricultural zones.

In Pennsylvania, the Brandywine Valley Association is composed of farmers, businessmen and local elected officials who maintain successful relationships with planning and conservation agencies throughout the valley in order to bring about the orderly growth and development of the Brandywine River Basin.

In Oregon, the Department of Land Conservation and Development encourages local governments to establish agricultural land retention programs. It has provided local officials with exclusive farm-use zoning mechanisms to preserve good agricultural land.

The recent development boom in and around Seattle has caused King County officials to become alarmed over the loss of their agricultural lands. A 50-million dollar bond issue for the acquisition of development rights will be brought before the voters as a possible method for retaining good farmland.

A farmland preservation bill has been introduced by Senator Warren Magnuson during Congress last year. This bill is aimed at allocating federal assistance to counties interested in developing their own agricultural preservation program.

In Whitman County, the last two years of comprehensive planning have paid off in the development of a zoning ordinance dedicated to the agricultural heritage of this area.

This zoning ordinance prohibits the development of subdivisions in the county, except those right next to existing towns. It does provide for rural residential housing, though—but on "marginal lands." Marginal lands normally occur near basalt outcrops, on gravelly soils, or in valleys near streams—but *not* in the flood plain.

Through planning and zoning, the effort to preserve Whitman County's agricultural land can produce a long-lasting security for the county's residents. With these safeguards, the Palouse will remain one of the richest grain-producing regions of the country.

But whether or not Whitman County succeeds in preserving its agricultural way of life lies in the decisions that you—the people of the county will make in the years to come.

MAJOR SOURCES OF INFORMATION

1. Regional public television station
2. Local public radio station
3. Film libraries.
4. Photographers from local newspapers

Trips by County Officials

The Environmental Education grant enabled several county officials to visit other regions attempting agricultural land preservation programs. All of these officials are farmers, and interviews in the other regions were sought with officials who are also farmers. The purpose of the trips was to discuss with other officials and to view firsthand how their programs were working. The regions selected were ones that demonstrated attempts at various techniques for farmland retention and had received publicity about their innovation and/or success. Visits were made to the East, Midwest and Northwest. In addition, interviews were held with federal officials involved in this issue. Each of the visits was filmed for the television documentary so that what was learned could be made available to more people.

The areas visited include Black Hawk County, Iowa; Madison and Walworth Counties, Wisconsin; southeastern Pennsylvania; Burlington County, New Jersey; King County, Washington; Salem and Benton Counties, Oregon; and Washington, D.C.[9] The interviews in Washington, D.C., included Washington Senator Warren Magnuson (a Democrat), Vermont Representative James Jeffords (a Republican); and officals of the Department of Agriculture, the Soil Conservation Service, the Department of Housing and Urban Development, the Department of Health, Education and Welfare; and the Congressional Research Service. Representatives of the National Trust for Historic Preservation were also interviewed.

Those who participated felt these trips were helpful. The visits to other parts of the country helped to reinforce the efforts that Whitman County officials had already atempted. The Whitman County farmers were shocked when they witnessed first hand the massive destruction of farmlands in the East and the Whitman County officials expressed the feeling that they were doing a good job. "We've got nothing to be ashamed of in Whitman County," Harry Wegner remarked with pride to a local reporter on his return from one of the trips, "We have a good beginning."

Local officials in other areas will probably not be fortunate enough to travel around the country to view firsthand the efforts of others. Still, communication with other officials who are developing programs is a necessity. There are a growing number of state and national organizations which can help facilitate this communication.

[9]Each of these state programs is discussed in the next section.

MAJOR SOURCES OF INFORMATION

1. The U.S. Department of Agriculture has organized a joint committee on land use which publishes an informative newsletter, *Land Use Notes*. Information about this newsletter can be obtained from:

   Warren Zitzmann, Editor
   Land Use Notes
   Soil Conservation Service
   U.S. Department of Agriculture
   P.O. Box 2890
   Washington, D. C. 20013
   (202) 447-5810

2. The National Agricultural Lands Study now underway is also a good source of information, contact:

   Bob Gray
   National Agricultural Lands Study
   Room 5020, New Executive Office Bldg.
   722 Jackson Place, NW
   Washington, D. C. 20006
   (202) 395-5832

3. The following national organizations have an interest in agricultural preservation:

   The American Land Forum
   (Charles Little, President)
   1025 Vermont Avenue, NW
   Washington, D.C. 20006
   (202) 347-4516

   The American Planning Association
   1776 Massachusetts Avenue, NW
   Washington, D.C. 20036
   (202) 872-0611

   Conference on Alternative State and Local Policies
   (Cynthia Guyer)
   1901 Que Street, NW
   Washington, D.C. 2009
   (202) 234-9382

   Council of State Governments
   PO Box 11910, Iron Works Pike
   Lexington, KY 40511
   (606) 252-2291

   National Association of Counties
   1735 New York Avenue, NW
   Washington, D.C. 20006
   (202) 785-9577

National Trust for Historic Preservation
Mid-Atlantic Office (Samuel Stokes, Director)
740-748 Jackson Place, NW
Washington, D.C. 20006
(202) 638-5200

Rural America
(David Raphael, Director)
1346 Connecticut Ave., NW
Washington, D.C. 20036
(202) 659-2800

Soil Conservation Society of America
(Max Schnepf)
7515 NE Ankeny Road
Ankeny, IA 50021
(515) 289-2331

4. In addition, there are numerous state and local organizations with an interest in farmlands preservation. The Grange, Farm Bureau, and specific commodity groups (wheat, milk, mushrooms, etc.) are key local organizations.

The County Fair

In rural areas, the county fair is a major annual social event. Local groups and organizations produce colorful booths explaining their programs, amidst canned goods, quilts, and homemade pies. The Whitman County Regional Planning Council decided to produce a booth for the county fair concentrating on its agricultural preservation efforts. Included in this booth were the audiovisual presentation, a large inventory map of the soil types in the demonstration study area, an ecological planning game, and copies of the county's comprehensive plan and zoning ordinance. The large inventory map of soils information resembled the quiltwork of the Palouse women.

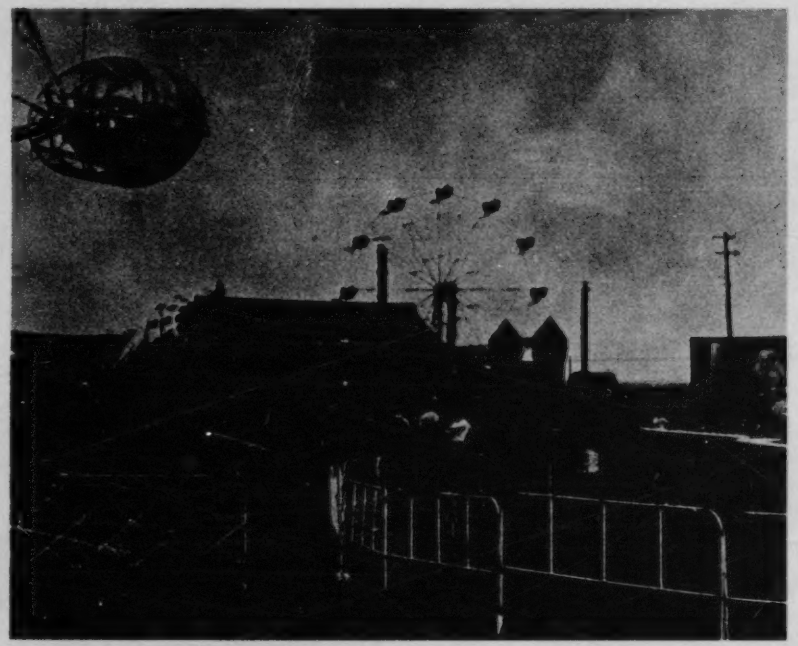
This booth created the opportunity for face-to-face discussion about the issue with many individuals who do not normally attend meetings. The game that was created was a simple spinning wheel. Half the wheel showed a topographic cross-section near Albion, while the other half listed the natural factors and land use that could be found at a specific point on the cross-section. Many people enjoyed playing with this wheel and there was much interesting discussion. The county fair provides an excellent occasion to interact with the rural community.

Publications

Two publications were produced as a result of the project (in addition to this publication, which is intended for a wider audience than Whitman County and several academic reports). The first was a report for the Technical Advisory Committee, the County Commissioners, and the Planning Commission on the future alternatives for farmland in Whitman County. In addition to presenting alternatives, this report also reviewed past efforts, other local programs, and state and federal interest. A considerable amount of time was spent reviewing similar reports printed in other regions. The report is 46 pages in length. A second, much briefer circular was printed by the Washington State Cooperative Extension. This circular is 4 pages in length.[10] As with the television documentary and audiovisual presentation, it was felt flexibility was important. Some people's interest and needs could be suited with a simple circular, while others needed a more comprehensive report.

MAJOR SOURCES OF INFORMATION

1. Other local governments with farmlands programs
2. State cooperative extension service



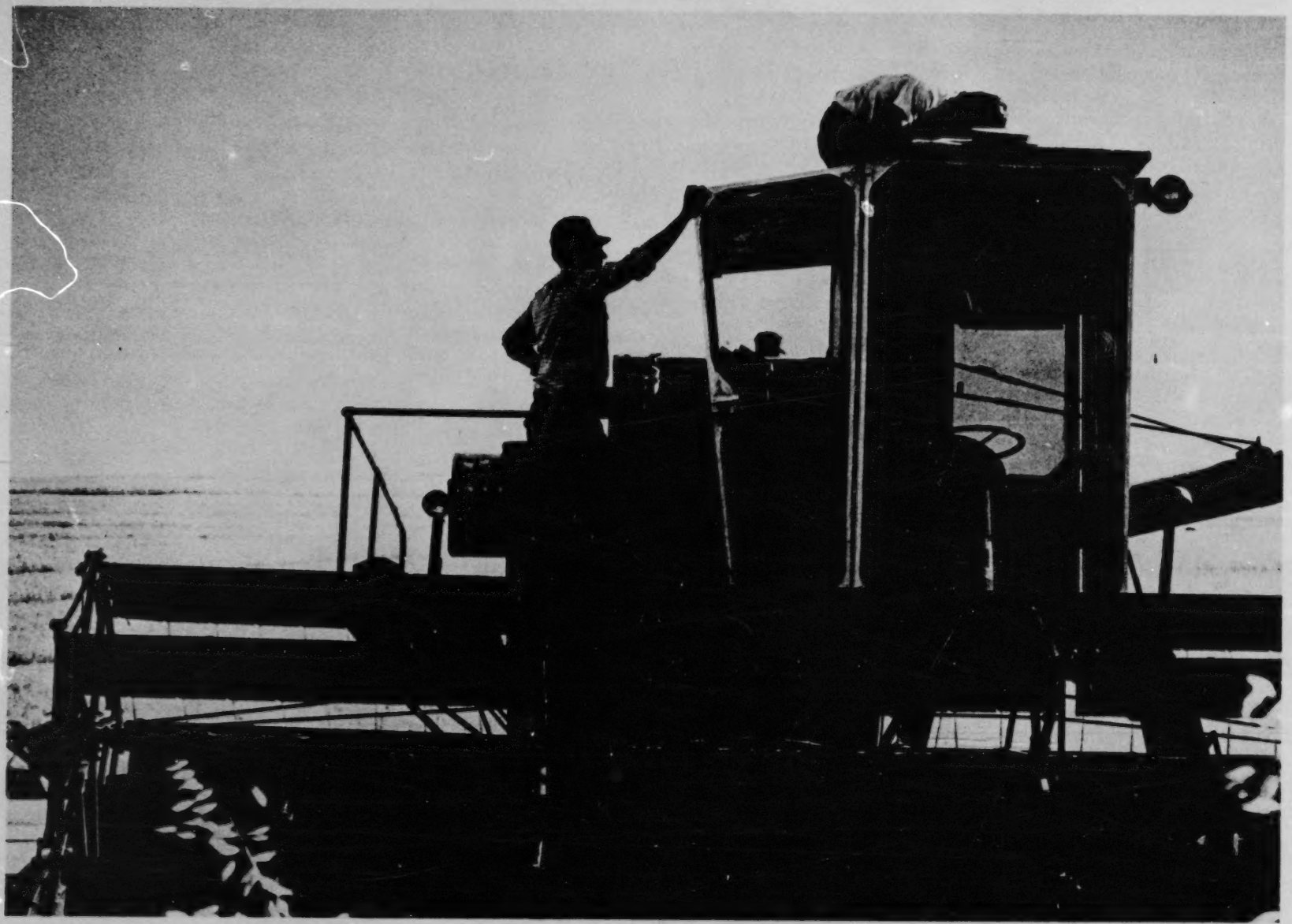
[10]This circular was written by Bill Wagner, John Theilacker and myself. It is entitled "Local Approaches for Farmlands Preservation in Washington State" and is available from Cooperative Extension, Washington State University, Pullman, WA 99164. The larger report is entitled "Agricultural Land Preservation: Alternatives for Whitman County" and is available from the Whitman County Regional Planning Council, Old National Bank Building, Colfax, WA 99111.

Community Meetings and Workshops

In every community there are numerous community groups ranging from the League of Women Voters to the Rotary and the Grange. In the fall and winter of 1979 and 1980, many community meetings and workshops were held explaining the issue of agricultural land preservation, the county's comprehensive plan and zoning ordinances, and the area's future alternatives. All types of community groups were contacted including various student groups, who will be the future stewards of the land, and the conservation districts, who are its current stewards. Special attention in these workshops was paid to the natural characteristics of the land and how planning relates to the democratic process. The television documentary and the audiovisual presentation were used in these workshops, and those expressing an interset were given publications. Again, it is important to mention flexibility. A 19-minute presentation may suffice for one group, while another group may require an hour workshop.

MAJOR SOURCES OF INFORMATION

1. Local Chambers of Commerce often maintain a list of community organizations and contact people which can be quite helpful
2. Phone books
3. Newspapers and radio and television stations
4. County extension agents
5. Local planning agencies



Earlier, the ecological planning method was presented as a neat, linear process—first state the objective, then inventory. Analysis, synthesis, alternatives, implementation and evaluation would then follow. Unfortunately, in real situations there is not an opportunity to follow this process in a step-by-step progression. This was the case in Whitman County. Alternatives for agricultural land preservation were developed and implemented many years before any inventory work was undertaken. An urban growth corridor or transitional zone and a 20-acre minimum large-lot zoning requirement were both implemented before any substantial inventory was completed and even before the Soil Conservation Service published a basic soil survey. Once inventories were completed, new alternatives were investigated. The Whitman County Regional Planning Council staff completed technical inventories of such factors as population, land and water resources, transportation, public facilities and services, conservation and natural hazards, economic trends, and housing during the process of revising the comprehensive plan. This plan helped define the object for planning in the county by adopting an agricultural preservation policy that allowed for new alternatives for the protection of agriculture and the family farm in Whitman County.

The Environmental Education grant allowed county officials to complete a thorough ecological inventory of a demonstration area, to investigate methods of agricultural land preservation that are being attempted in other regions of the United States, and to present those alternatives to local residents. Again this was not a neat, linear process. While county officials were travelling to various regions of the country, zoning ordinances were being adopted and the Technical Advisory Committee was meeting to discuss the issue. What was found on the trips and what was discussed in the Technical Advisory Committee influenced the adoption of the zoning ordinances. We will now review the various alternatives that are being attempted and discuss the relevancy of each for potential use in Whitman County. The alternatives will be reviewed on the federal, state and local levels. The efforts of private organizations and the future alternatives for Whitman County will also be discussed.

Federal Programs

The federal alternatives available for farmland preservation include action which has been taken and which may be taken by the legislative, executive and judicial branches of government. National land-use policy and planning assistance acts have received recent serious consideration by Congress. But, as of yet, there has been no comprehensive national land-use policy developed. There has been, however, in the past decade a movement towards resource protection that has resulted in several important acts affecting land use. In addition, farmland protection acts have been discussed in the 95th and 96th Congresses.

Legislative Action

In the 95th and 96th Congresses, Washington Senator Warren Magnuson introduced national farmlands protection legislation in the Senate, while Vermont Representative James Jeffords presented a similar bill in the House. Though neither bill has yet passed, both appear to have a good chance of becoming law in the future. The Farmland Protection Act, co-sponsored by Magnuson and seventeen other senators, would establish a policy to ensure that the activities of the federal government are consistent with the need to protect farmlands. This bill was also designed to assist states, counties and other local governments in their efforts to reduce the amount of farmland being lost to non-agricultural uses. The Bill contained four sections (U.S. Congress 1979).

Norm Hatley and Senator Warren Magnuson

The first section of the Farmland Protection Act, Title One, provides for a national farmland protection policy. To implement this policy, federal agencies would be directed to establish procedures of considering the effects of major federal actions on agricultural land so that those actions do not cause the irreversible loss of farmland

unless other national interests override the importance of preservation. This policy also called for technical assistance and matching funds for state and local farmland protection programs. A key provision of this title would require federal agencies to conduct programs and regulatory activities in a manner that is consistent with farmland protection programs established by a state or local unit of government (U.S. Congress 1979). Essentially, this would require federal agencies to make a farmland impact analysis.

Title Two would direct the secretary of the Department of Agriculture to develop, gather and make available information necessary to assist states and local governments making decisions concerning agricultural land. The focus of this effort would be a three and one-half year study of the quantity, quality, location, ownership and financing of agricultural land; the relation of such land to the supply, demand, and production of food; the relationship between the national need for agricultural land and other national concerns (such as energy); and the effects of federal actions on the use of farmland. The report would also identify methods of protecting and improving farmland, including an analysis of relative costs and benefits of such methods (U.S. Congress 1979).

Titles Three and Four provide for research and technical assistance. Under the research program, states and local governments could apply to the secretary of USDA for matching funds to conduct demonstration programs which test methods to reduce the quantity of farmland being converted to non-agricultural usts. The technical assistance program authoriezd the Soil Conservation Service to provide technical assistance to states and local governments on methods of protecting farmlands (U.S. Congress 1979).

Congressman Jeffords has explained the importance of his bill in the following manner:

> *"I think there's no more important problem to the United States than preserving its agricultural land. I think it will dwarf the energy issue. If the facts are correct, that we only have some twenty four million surplus acres of prime agricultural land left, and if we're losing it at the rate of about three million acres a year, then in a very short time, we're going to have to start moving off of that land into marginal land, and that's going to increase food prices. Secondly, we know on the international level that the need for food is going to increase dramatically. We're going to have to produce as much food in this world between now and the end of this century that's been produced since the beginning of time. That gives the United States a tremendous opportunity on the one hand. Economically, it could really solve many of our balance of trade problems—if we are now able to produce the food which the world is going to need. And finally, of course, we have to worry about our own people. If we aren't able to produce the food to feed ourselves, then we will have lost the real core of our economy, and our ability to have the lifestyle we have today."*

Executive Action

In addition to the congressional interest, there has also been increased interest in farmland preservation by the executive branch of government. Agencies which have taken action or expressed an interest in the issue include the Department of Agriculture, the Environmenal Protection Agency, the Council on Environmental Quality, the Office of Coastal Zone Management, the Department of Housing and Urban Development, the Department of Health, Education and Welfare, and the Department of the Interior. The Department of Agriculture, the Council on Environmental Quality, and the Environmental Protection Agency have adopted policy statements supporting the concept of protection of prime agricultural land from indiscriminate development. In June, 1976, the Department of Agriculture urged other federal agencies, in conducting their programs, to avoid activities that would destroy farmland (Fletcher 1978).

The Department of Agriculture has been the most active federal agency, for obvious reasons. The Department of Agriculture's activities have included identifying the issue, development of a policy for government programs, and technical assistance through the Soil Conservation Service. The Department's activities have been coordinated by the USDA Land Use Committee, an interagency group established to coordinate land-use policies and programs.

The USDA Land Use Committee sponsored the "Seminar on Retention of Prime Lands" a two-day meeting in July, 1975, to consider the questions and issues raised by the continued conversion of "prime food, fiber, and timber producing lands to other uses." The participants concluded that there was "a frustrating lack of data [that] prevents a clear picture of either the current situation of the probable future amount of land available or needed for agricultural production" (U.S. Department of Agriculture 1975). The conclusion that the participants reached at this seminar was:

> *"The demand for food, fiber and timber from the United States is expected to increase to the point where the production capability of the nation will be tested, although it is not certain when or with what degree of urgency this will*

occur. Export demand is expected to contribute an increasingly large share of the market for United States products" (U.S. Department of Agriculture 1975).

This meeting and its resulting publications have prompted much of the federal interest in the issue. The Department of Agriculture has urged other federal agencies to evaluate the impact of their programs on farmlands. Accordingly, the Department of Agriculture has agreed to place a major emphasis on the review and evaluation of draft environmental impact statements with respect to impacts on prime and unique farmlands. Secretary Bergland issued a policy memorandum on October 30, 1978, that stated:

> *"Decisions concerning land use arise from needs to maintain and stimulate economic development; maintain and enhance agricultural, rangeland, and forest production capabilities; provide or improve community services, facilities, and living space; to preserve the natural environment and associated wildlife and recreational values; and to assure adequate supplies of high-quality water. These needs are highly interdependent and often competitive for the limited supply of available and suitable land. Responsible levels of Government must encourage and facilitate the use of our Nation's land resources with wisdom and foresight" (U.S. Department of Agriculture 1978, p. 1).*

Bergland continued by observing that the Department of Agriculture had the power to implement this policy by coordinating its own programs. One program affected thus far by the Department of Agriculture's policy is the Farmer's Home Administration. The Farmer's Home Administration has been criticized for its support of the conversion of agricultural land to other uses. This agency makes loans and grants in rural areas for single-family housing, multi-family housing, farming, water and sewer projects. Because of the structure of the Farmer's Home Administration, each state must individually take action to comply with the overall policy. Michigan was the first state to take such action. The Michigan State director, Robert L. Mitchell, issued a policy on February 5, 1979, that stated:

> *"The Farmer's Home Administration in Michigan will no longer make loans which will unnecessarily convert agricultural, timber and wet lands to other uses."*

The Department of Agriculture, through the Soil Conservation Service is also involved in the nationwide inventory of important farmland using its Prime and Unique Lands Classification System. In addition to this relatively recent involvement, the Soil Conservation Service has a long and distinguished history of publishing county soil surveys. These surveys are an involuable resource for planning.

The Council on Environmental Quality identified farmland as a consideration which should be included in environmental impact statements. The agency responsible for administrating these statements, the Environmental Protection Agency, issued a policy to protect environmentally significant agricultural lands on September 8, 1978. The purpose of this policy was *"to establish EPA policy that will recognize the food production and environmental value of agricultural land and the necessity to protect them"* (U.S. Environmental Protection Agency 1978). This policy is anticipated to affect EPA's construction grant program or municipal sewage treatment works, which many have criticized for contributing to urban sprawl (Fletcher 1978).

A Council on Environmental Quality and Department of Agriculture interagency task force has been recently formed to compile a more in-depth analysis of this issue from a national perspective. This National Agricultural Lands Study will determine the nature, rate, extent and causes of the reduction in the land base of American agriculture. It will also evaluate the economic, environmental, and social consequences of agricultural land conversion and of various measures intended to prevent or retard this conversion. Furthermore, this task force will recommend administrative and legislative action, if found necessary, to reduce the losses to the nation as a result (National Agricultural Lands Study 1979).

Other federal agencies have addressed this issue to varying degrees. The protection of agricultural land may be a component of some of the state coastal programs which are required by Congress in the Coastal Zone Management Act of 1972. Though no such component has yet been included, officials of the Office of Coastal Zone Management have expressed such an interest. The National Flood Insurance Program, administered by the U.S. Department of Housing and Urban Development, may have the effect of protecting farmland through its goal of reducing flood plain development because many good farmland areas follow river valleys. HUD also has an interest in agricultural preservation through its 701 grant program which provides planning assistance to local governments.

The Department of the Interior has an interest in the issue through its involvement with various land and resource inventory programs and as a result of the Surface Mining Control and Reclamation Act of 1977. The Surface Mining law addresses the issue of the conflict between mineral and food resources. The U.S. Department of Health, Education and Welfare has been involved in agricultural preservation through its Office of Environmental Education.

Two agencies which have shown a surprising (and alarming) lack of interest are the Departments of Energy and Transportation. The Department of Energy's lack of interest is alarming because the conversion of marginal lands to agricultural use is energy expensive. In addition, good agricultural lands are often close to markets and thus the energy costs for shipping agricultural goods is less. The Department of Transportation should be interested in preserving farmland for the same reason. Existing railroad and water networks link land currently in agricultural use to markets and suppliers. The Department of Transportation has also historically ignored productive agricultural land in the planning of highways. Interstate 5, for instance, was built through the center of the fertile Willamette Valley in western Oregon, removing thousands of acres of fertile land from production and dividing farms which creates hardships for farmers. Shifting this highway's alignment to the east or west by a few miles could have preserved much of this land. Such highway "planning" has caused much grassroots bitterness and skepticism about state and federal programs.

Judicial Action

The courts have also taken an increased interest in land use during the past decade. The best reviews of this trend are offered by Fred Bosselman, David Callies and John Banta's *The Taking Issue* (1973) and the National Resources Defense Council's *Land Use Controls in the United States* (1977). The general conclusion of these books is that the courts have moved generally towards the protection of the nation's resources. Though the issue of agricultural preservation has not been addressed yet by the federal courts, there are arguments that agricultural land is protected by the Constitution. The environmental attorney, Victor Yannacone, argues that,

> *". . . preservation of the agricultural productivity of the Class I, Class II, and Class III soils of the United States is one of those unenumerated rights retained by the People of the United States in the ninth amendment, and entitled to protection under the equal protection and due process clauses of the fifth amendment, and the right, privileges and immunities, due process, equal protection clauses of the fourteenth amendment" (1975, p. 615).*

Influence on Whitman County

Okay then, how does all this federal action influence a local govment like Whitman County? The emphasis of both the Magnuson and Jeffords bills is to coordinate federal programs yet leave the state and local governments with the decision-making power. Such legislation would influence the ability of a federal agency to convert farmland to other uses. For instance, it would influence the planning of the Army Corps of Engineers for such projects as dams or pumped storage units. The research and technical assistance sections of Senator Magnuson's bill could be helpful to Whitman County's efforts to enforce its agricultural preservation policy and zoning ordinance. For instance, funds could be used to help the county planner, the district soil conservationist and health official determine if a specific parcel of land meets the performance standards for rural housing established in Whitman County's comprehensive plan and zoning ordinances.

The various actions taken by federal agencies have also influenced Whitman County. Probably the most interaction has occurred with the Soil Conservation Service. Locally, this valuable agency has been extremely helpful in completing ecological inventories, has been involved with the Agricultural Preservation Technical Advisory Committee, has mapped the prime and unique lands, and has worked with the Water Quality Committee whose primary objective is to stop erosion. On the state and federal levels, the SCS has been supportive of Whitman County's efforts. The Farmers Home Administration policy might have a future impact, as may actions taken by EPA and HUD. HUD has already had some impact since it has helped finance the development of the comprehensive plan and the rural housing feasibility study. HEW, through its Office of Environmental Education program, has also been involved through the sponsorship of the Ecological Planning Demonstration Project. Federal court action may also have a long-term impact on the county's rolling wheat fields.

State Programs

Alternatives for the protection of farmlands have been created by action taken by various states. Many states have used preferential tax policies for farmland as a preservation tool. This technique has met with limited success. A few states, notably Hawaii, Oregon, Vermont, and Wisconsin have attempted land-use policies directed at resource management and comprehensive state land-use planning. Oregon and Wisconsin's efforts merit closer scrutiny. Washington has taken some action which will also be reviewed.

Oregon's Land Conservation and Development Commission

Oregon's efforts to preserve its farmland predates the passage of its land-use bill in 1973, which created the Land Conservation and Development Commission (LCDC) and its staff; the Department of Land Conservation and Development. The first legislative action was

the "Greenbelt Law" passed in 1961. This law allowed agricultural land to be placed within an Exclusive Farm Use (EFU) zone and assessed for tax purposes at its farm-use value. Since 1961, the Oregon legislature has continually updated and refined the EFU zone and the method of farm-use value tax assessment. The 1973 Legislative Assembly completed a major update and revision of these statutes and adopted Oregon's agricultural land-use policy. This policy clearly set forth the legislative intent and purpose of the EFU zone and the use of farm-use value assessment. There are four basic elements of this policy:

1) Agricultural land is a vital natural and economic asset for all the people of the state;
2) Preservation of a maximum amount of agricultural land, in large blocks, is necessary to maintain the agricultural economy of the state;
3) Expansion of urban development in rural areas is a public concern because of conflicts between farm and urban activities; and
4) Incentives and privileges provided by EFU zoning encourages owners of agricultural land to hold those lands in EFU zones (Land Conservation and Development Commission 1977).

Concurrent to the adoption of the agricultural land-use policy, Oregon's legislature approved its comprehensive planning law, Senate Bill 100. In addition to creating LCDC whose citizen members are appointed by the governor, the law authorizes LCDC to coordinate comprehensive planning in the state. The LCDC was empowered to set common goals to be considered in every local plan throughout the state. Nineteen of these statewide goals were eventually adopted.[11] These goals set the standards for citizen involvement; agricultural, forest and natural resource land protection; housing; provision of public facilities and services; urban growth; protection of the Willamette River Greenway; and coastal zone management. These goals establish regulations that local governments must follow in their comprehensive plans and implementation ordinances to obtain LCDC approval. Most of Oregon's 278 jurisdictions had submitted plans to the Department of Land Conservation and Development for review by the Land Conservation and Development Commission's July 1980 deadline.

The third statewide goal addresses agricultural land. This goal states:

> *"Agricultural land shall be preserved and maintained for farm use, consistent with existing and future needs for agricultural products, forest and open space" (Land Conservation and Development 1977).*

The agricultural goal also defines which land types are to be identified as agricultural and protected by local comprehensive plans. The land types are defined by using SCS soil capability classes. The use of soil capability classes has received some criticism by those who feel other biophysical and social factors should also be considered. The agricultural goal further states that the lands identified and protected by the comprehensive plan, must be placed in the EFU zone unless it is already committed to or needed for urban or rural non-farm use.

This requirement, that lands must be placed in an EFU zone, is the major difference between Oregon's agricultural land preservation program and those of other states. While most states have voluntary farm-use value tax assessment programs, Oregon directly links comprehensive planning and zoning with its farm-use value tax assessment program. Further, Oregon's program also specifies on the basis of the soil's resource capability, which agricultural lands are to be placed in the EFU zone and given special farm-use value tax assessment (Land Conservation and Development Commission 1977). Again, the process for determining resource capability could be refined, perhaps through the use of ecological planning; but nevertheless, Oregon has made an important step in connecting planning policy to the land.[12]

One other item makes Oregon's situation novel. While in many states, good legislation is passed, it is soon quickly forgotten or amended to death by special interests. A lobby group, 1000 Friends of Oregon, was organized to make certain local governments comply with state law. The 1000 Friends of Oregon, with its highly dedicated, professional staff, has taken several municipalities to court over compliance with the statewide goals and has been very successful. Several court cases have directly involved the agricultural land goal.[13] The net result is that Oregon not only has a good law, well-defined statewide goals, a citizens commission with a professional staff, and a watchdog group but, also, a record case law. In addition, the law has been challenged twice (in 1976 and 1978) in statewide referendum, and each time the law was supported by a wider margin of voters. The last election vote for retaining the law was overwhelmingly in favor of retaining the LCDC.

[11]These goals have been published in an accessible newsprint format and is available from the Oregon Department of Land Conservation and Development, 1175 Court Street N.E., Salem, OR 97310.

[12]The best early review of Oregon's program is provided by Kartez (1976).

[13]These cases include *1000 Friends vs. Marion County, Cook vs. Clackamas County, Rutherford vs. Armstrong, Lord and Skepetos vs. Jackson County, 1000 Friends vs. Benton County, 1000 Friends vs. Multonomah County, Meeker vs. Clatsop County, and Meyer vs. Lord.*

Benton County is an example of Oregon's program. Oregon State University, the state's land-grant institution, is located at Corvallis, the county seat. The growth of Oregon State University has been similar to that of Washington State University, and this growth has resulted in the conversion of the area's fertile farmland. Benton County is located in the Willamette River Valley, south of Portland and Salem and north of Eugene (*Figure 51*). Half of Oregon's annual farm income and seventy percent of its population are in the Willamette River Valley.

The first statewide goal is for citizen participation in the planning process. Benton County was divided into smaller, more manageable areas for citizen participation. These areas were inventoried using USGS quadrangle maps for the base for such factors as soil classification, property ownership, surface water, elevation and slope, and land use.

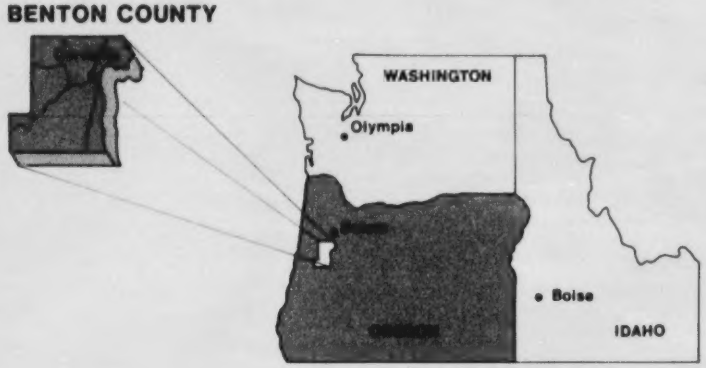


Figure 51 Regional Location of Benton County, Oregon

The most difficult question facing the citizens and the planning staff was where to establish the boundaries for the exclusive farm zones, the forest zone and the urban growth boundaries. Urban growth boundaries are those areas in Oregon where towns and cities are permitted to grow based on population projections for future land-use needs. Where this boundary is established greatly influences real estate value.

The planning staff used the SCS soil classification for agricultural land and the U.S. Forest Service manual "Field Instructions for Integrated Forest Survey and Timber Management Inventories—Oregon, Washington and California 1974," for forest land. The resulting inventory maps indicated fairly distinct boundaries between agricultural and forest zones, the agricultural areas lying in the valleys and the forest areas on the mountain slopes. There are some marginal areas that are not highly productive for either timber or crops. Where boundaries between agricultural and urban areas should be made was not clear since, in many instances the best areas for farming also were good for housing. After many public meetings, boundaries were established which encroached on a minimum of the best farmland. The public meetings, in addition to helping to delineate boundaries, were also helpful in establishing support for the county's plan.

Once boundaries had been established through the meetings, the comprehensive plan was developed and submitted to the LCDC for approval after which, zoning ordinances to implement the plan were developed. Benton County found that once the boundaries for the exclusive farm use zone were established, farmers started to invest more heavily in those areas. Because of the capital expense required for farming, some of the risk was removed when it was determined that an area would be used solely for agriculture.

Wisconsin's Farmland Preservation Program

While Wisconsin's agricultural preservation has similarities to Oregon's, it does not require all local governments to develop a program nor is it linked to other statewide issues. Still, Wisconsin's efforts are noteworthy. Wisconsin's Farmland Preservation Act places much of the initiative on local governments. The state assists, rather than insists as in Oregon, local governments which want to preserve farmland through local planning and zoning, and provides income tax credits to those farmers who participate.

Wisconsin's program has two stages. The first stage began on June 29, 1977, when the Act became law and continues for five years until 1982. In the initial program, during the first five years, any farmer can qualify for tax credits by voluntarily signing a contract; the farmer agrees not to develop his or her land in exchange for the state income tax credits (Barrows 1978).

Another unique feature of Wisconsin's program is that before qualifying for tax credits, the farmer must either have an SCS farm conservation plan or request that a plan be prepared by the local conservation district and SCS. The Wisconsin program is the only one in the nation which links tax credits both to local zoning and to the conservation of the land.

After 1982, tax credits depend on the action of local governments. In order for farmers to remain eligible for tax credits, county governments must take some planning and zoning action. While counties are not required by the state to do anything, tax credits are linked directly to local action. So, by October, 1982, counties must take the following action for their farmers to receive tax credits:

1. In urban counties—in counties over 75,000 population or adjacent

to counties with over 400,000 population, the land must be under a certified exclusive agricultural zoning ordinance to be eligible for credits.

2. In rural counties—in counties with 75,000 population or less, the land must be under either a farmland preservation plan or an exclusive agricultural zoning ordinance to be eligible for credits (Barrows 1978).

The county often used as an example of Wisconsin's program is Walworth. This is partly because Walworth County's efforts predated the state law and actually helped influence its development. Walworth County is located near the metropolises of Chicago, Milwaukee and Madison *(Figure 52)*. It is within one and one-half hours driving distance of nine million people. There are many clean, glaciated lakes in the county, including Lake Geneva, which attract many urban visitors to the area.

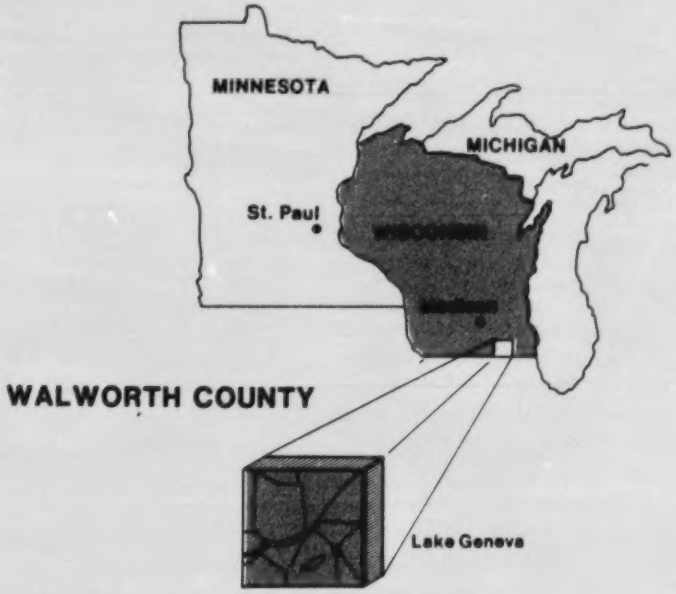


Figure 52 Regional Location of Walworth County, Wisconsin

Walworth County's success depended largely on the close cooperation of the county, the regional planning council, the SCS, the University of Wisconsin Extension Service, and an organized citizens group called the Farm Council comprised of representatives of the Grange, Farm Bureaus, the Pure Milk Association, and other active farm groups. After developing a comprehensive plan and zoning ordinance in 1974, an extensive education process was undertaken which eventually involved 500 public meetings. The comprehensive plan followed the state-mandated policy requiring shoreline, floodplain, subdivision and forestry regulations. The purpose of these meetings was to explain the general scheme of the plan and to work with individual townships to develop criteria for protecting agricultural land. Criteria for lands which were to be preserved resulted from a combination of both SCS data and farmers' own determination of what consituted prime land. Those areas determined as prime (approximately 50% of the county) were zoned A-1, which set up a 35-acre minimum development size. Other agricultural zones were developed for less productive lands. All of the 17 townships in the county adopted the county model (or a close variation) and identified prime lands. So, Walworth County farmers qualify for the state program (Toner 1978).

Washington's Scattered Efforts

Washington State has not made the extensive commitment to agricultural land preservation that Oregon and Wisconsin have. Still, there are many existing laws which can assist in preservation efforts. These laws include the Planning Enabling Act, the Open Space Taxation Act, the State Environmental Policy Act, and the Shoreline Management Act. Recent legislation in the state also provides for farmlands to be exempt from local improvement districts and have helped remove farmers from liability for normal farming practice. Washington's governor has also supported the concept of farmlands preservation.

Washington's Planning Enabling Act was modeled after the Standard City Planning Enabling Act published by the U.S. Department of Commerce in 1928. Washington's enabling legislation was first adopted in 1935. This act requires that comprehensive plans include land-use and circulation elements. The land-use elements designate the general distribution and location of land for agriculture and other uses. Optional elements for comprehensive plans include conservation, recreation, transportation, public services and facilities, public buildings, housing, renewal and/or redevelopment, and capital improvement. It is conceivable that one or more of these optional elements could be used to protect farmland. For instance, the conservation element provides "for the conservation, development and utilization of natural resources, including . . . soils." The enabling legislation also provides for the development of zoning ordinances. Recent court decisions in Washington have encouraged closer linkage between comprehensive plans and zoning. So, no longer can plans be "blue sky" documents, but rather well-researched policies that can be linked to action.

Washington's Open Space Taxation Act was first adopted in 1970. But it was essentially rewritten from scratch with amendments in 1973 (Dunford 1979). The goal of this law was similar to those of many other states. The program was aimed at preserving agricultural and open space in its current use. To accomplish this goal, land is assessed on the basis of its value in use rather than market value. The result was to be reduced property taxes for farmers. Farmers apply for the program with their county assessor and if their land meets certain criteria, their land is assessed at a lower level. Rural land must be enrolled in the program for a minimum of 10 years. After being in the program for at least 8 years, the owner can notify the county assessor, wait 2 years, and have the land withdrawn. Under these circumstances, a rollback tax equal to the taxes saved (plus interest) over the past 7 years is levied. If a landowner withdraws from the program before the 10-year minimum and/or without the necessary 2-year notification, the rollback tax plus a penalty equal to 20% of the rollback tax is collected (Dunford 1979).

This law, however, has not been effective in preserving farmland in those areas where development pressures are most intense. Many farmers are enrolled far from areas with development pressures. There are also those who enroll and later develop their land, simply passing along penalties to those buying the "developed" property. This law could be made more effective if it were linked to planning and zoning as in Oregon and Wisconsin.

The State Environment Policy Act (SEPA) and the Shorelines Management Act also may offer some possibilities for agricultural preservation. Under SEPA, an environmental impact statement must precede all government action significantly or adversely affecting environmental quality. This means that an environmental impact statement must be filed on any development requiring discretionary government approval if the development would itself significantly affect environmental quality (Planning Association of Washington 1977). Farmland significantly affects an area's environmental and economic quality. Farmland could be then considered in the SEPA review process, much the same way EPA considers it for federal environmental impact statements. For instance, the regulations under the State Environmental Policy Act authorizes communities to designate areas as environmentaly sensitive. It is conceivable that areas of prime, unique and/or important agricultural lands may be designated as environmentally sensitive by a local government.

Washington's Shoreline Management Act has been recognized as a pioneering effort by the U.S. Office of Coastal Zone Management. This Act, passed by a vote of the people of the state in 1972, requires and defines a planning program and a regulatory permit system which

are initiated at the local level under state guidance (Haworth and Anderson 1976). Rivers and larger streams are included in this program. Since there is significant farmland adjacent to rivers in the state, it would seem plausible that these lands be considered in the granting of permits by the Washington Department of Ecology.

One issue facing the conversion of farmland was addressed by a recent session of the state legislature. In Washington, local improvement districts (LID's) are units of land created by a local government for the purpose of levying special assessments against property specially benefited by improvements relating to such units. These improvements are generally identified as the extension of utilities such as water and sewer lines, or road construction and/or improvements. Non-exempt landowners are placed with the burden of paying, through property taxes, for all or part of the improvements. In agricultural areas that lie close to urban centers where suburban expansion is common, farmland owners are often subjected to high levels of property taxation and benefit assessment, and as a result of this overall increase in operating costs, are often forced to prematurely convert their lands to other uses.

In its 1979 session, the Washington State Legislature passed a bill providing additional tax relief for farmlands. House Bill 617 provides that farmland designated for current-use classification under the State Open Space Program shall be exempt from special benefit assessments as long as the land remains in such a classification. Lands which are withdrawn from this classification are assessed by the local government for the original benefit assessment charge plus prescribed interest and penalty. The legislature has shown continued interest in farmlands protection. The House Agricultural Committee has held several public hearings throughout the state on the issue and has discussed potential legislation, but no comprehensive action has yet been taken.

On January 4, 1980, Governor Dixie Lee Ray issued an executive order directing "every state department, commission, board or other agency of state government making decisions affecting the siting of energy facilities, disposal facilities, transportation systems or utility corridors, and agencies making decisions on enviornmental and/or land-use permits (to) consider farmland preservation when making decisions and, in addition, give due regard to local government planning, zoning, or other local government land protection programs."

In the state of Washington, almost every county from rural Asotin to urban King are being confronted with the issue of agricultural land preservation. The northwest, particularly Washington, is a region of immense natural beauty and is attracting new residents from the rest of the nation. This rapid immigration is threatening the very resources that make the region attractive, including farming. Unlike Oregon

which has taken a comprehensive approach to resource planning centered in one state agency, Washington has approached forest, shoreline and agricultural planning with scattered, unconnected legislation. The result is that county governments in this ecologically diverse state have been forced to approach planning on a piecemeal basis.

Other states are likely to be in a situation similar to Washington's. It is important to review existing laws to see how they may influence farmland retention. Instead of duplicating efforts, it is better strategy to start with what is possible within the existing structure.

Influence on Whitman County

Partly because of its elected leadership and partly because of the location of Washington State University, Whitman County has been in a better position to approach the issue of agricultural land preservation than have been some other counties. Farming is still the dominant social and economic force in the county, the elected officials are either farmers or maintain strong links to farming. They have taken advantage of state law, in particular, the planning enabling legislation and the Open Space Taxation Act. The planning enabling legislation has been used effectively in the planning and zoning process. Most of the farmers of the county, 95 percent, are enrolled in the Open Space program.

The state environmental impact statement review process can be used in the future by county officials. The use of the Shorelines and LID legislation in Whitman County, however, probably will not be extensive. Though the county's valleys are fertile, they are also susceptible to frequent flooding, which makes them risky for grain production. According to local SCS officials, farmers tend not to plant alongside the major waterways. Instead, they make extensive use of the dominant, rolling Palouse hills for wheat, while retaining the valleys for grazing. As a result, the shorelines law probably cannot be used for farmlands protection in Whitman County. Local improvement districts are not widely used in rural areas of the county because the county officials have not permitted suburban development outside existing communities. It s too early to gauge the impact of the governor's executive order, though it is certain to have some influence in the county.

Alternatives for Local Implementation

On the local level, a strong rationale for protecting farmlands is based on sound regional land-use planning which has historically sought to control "sprawl development" and its associated economic, social and environmental costs. Regional planners have developed various techniques to control sprawl, such as voluntary covenants, easements, purchase and/or transfer of development rights, agricultural or large-lot zoning, utility extension policies and performance standards. Each of these techniques will be discussed in general terms. Next, several local governments which have attempted to preserve their farmlands will be discussed. These communities include King County, Washington; Suffolk County, New York; Lancaster and York Counties, Pennsylvania; and Black Hawk County, Iowa.[14] A brief review of the planning techniques that have been used in Whitman County will follow.

Voluntary Covenants

Covenants are agreements, usually voluntary, that limit what can be done with property. These agreements appear in the property deed. Often all lots within a subdivision will have covenants attached to the land title that describe size and design limitations on homes or other structures such as outbuildings and fences. The same principle has been used to a very limited extent to control the use of land. In one instance, an entire town's land use scheme is controlled by covenants instead of zoning. In another, farmers in a particular watershed have agreed to keep their land in agricultural production rather than convert it to urban or industrial use.

If a covenant is broken, others affected by the action can bring suit to restore the original covenant-specified condition or receive compensation for damages. Covenants specify who can bring suit, including local municipalities. Traditionally, courts have upheld suits regarding covenants only if it can be demonstrated that a certain party is not adhering to all agreements stated. Since neighbors find it very difficult to bring suit against each other, more often than not covenants are not enforced. Therefore, the use of voluntary covenants would only be a reasonable means to control the use of agricultural lands as long as the parties affected by the covenants are willing to see that they are enforced. However, covenants could be made more efficient in land use control if a non-partisan party (i.e., government) were employed to enforce voluntary agreements.

[14]These examples are by no means exhaustive. For a more in-depth analysis of local planning techniques, see William Toner's *Saving Farms and Farmlands: A Community Guide* (Report No. 333) which is available through the American Planning Association, 1313 East 60th Street, Chicago, Illinois 60637.

Easements

An easement is the purchase of partial rights of a piece of land. It is enacted through an agreement between one party and another for the purpose of a specific use. The most common form of easements occurs when a property owner agrees to let a utility company cross his or her land with a service line. Easements can also be made to provide access across one property to another. The right to the limited use specified in the easement is usually purchased for a specified period of time which can be indefinite.

Governments have purchased easements for scenic or aesthetic purposes. In this case, the seller of the easement agrees not to alter the land in a way that would change its scenic value. For example, a grove of trees may be of sufficient historic, aesthetic or ecological value warranting a local, state or federal government to purchase an easement that would prohibit the removal of the grove.

Similarly, it might be possible for the government to purchase an easement which would limit the use of land to agricultural production. This limitation could be for a specified period of time and paid for at a mutually agreed upon price. The purchaser controls and limits use of the land for a specified period. However, the land and all its associated rights ultimately rest with the property owner.

Purchase of Development Rights (PDR)

Within the last ten years, planners and some local governments have been discussing a concept that property ownership and the rights to the development of property can be completely separated. One person can own the land while another can own the right to develop the same parcel of land.

In the purchase of development rights, the property owner's development interests are relinquished to the purchaser of the development rights who will control the use of the land. In most cases, a public (i.e., governmental) entity purchases the development rights and holds them in trust, thereby, withdrawing them from use.

This land-use management concept is viewed as a means of divesting the development potential of the property so it will remain in its present use (e.g., natural area, agricultural, historic building or site). The purchase of development rights would be especially useful when zoning mechanisms or covenants are limited either through inappropriateness or by a lack of authoritative control.

The criticisms of this approach are that the cost of development rights is very expensive and, that if the agricultural industry of an area has already been decimated, why bother? These arguments are countered with the fact that while they may be expensive in the short run, the cost of purchasing the development rights may be much higher in the future. With energy costs rapidly increasing, it may soon be more profitable to farm close to the market place where increasing transportation costs can be kept at a minimum.

Transfer of Development Rights (TDR)

This land-use management technique is also quite new. It involves the same "development rights" referred to in the previous discussion. However, in this case the development rights are purchased to be used in another location, thereby separating the development rights from the land itself. These rights are not withdrawn as with the PDRs, but are placed in the private market (Barron 1975).

The TDR concept was developed to help mitigate the problem of zoning windfalls and wipeouts. For example, a rezone of an owner's property from agricultural to urban could cause an increase in value which could financially benefit the landowner, thus creating a windfall. However, the agricultural use may be affected negatively by the land value increase, causing a wipeout situation. The transfer of development rights attempts to distribute economic gains created by development from all property owners in an area, not just those who receive a windfall from a favorable zoning decision (Barron 1975).

The actual transfer can best be described through the following example. A county commission designates two 100-acre parcels of land, A and B. Each parcel is zoned for residential development at one unit per acre. The commissioners later decide that parcel A should remain in its current agricultural use. So, to insure the continued agricultural use, it permits the transferring of the one unit/acre development rights from parcel A to parcel B. A purchaser of parcel A's development rights can then use those rights to develop parcel B at one unit per *half* acre, which amounts to the original one unit per acre, plus the transferred unit per acre.

Although this example is highly simplified, the transfer unit of development rights has yet to be attempted on any large scale basis, due primarily to its complexity.[15]

[15]For more information about Transfer of Development Rights, see James Barron's *Transfer of Development Rights* (Extension Bulletin #3939), which is available from the Washington State University Cooperative Extension, Pullman, Washington 99164.

Agricultural or Large-Lot Zoning

Agricultural or large-lot zoning is one of the most popular methods used to control residential development and to protect farmland. In this approach, development is limited to a minimum lot size—5, 10, 20, or 40 acres. Then, only specific uses related to farming are permitted, such as housing for the farmer, the farmer's relatives and farm workers; and buildings related to farming (barns, grange halls, grain elevators, etc.). The idea behind this type of approach is that the cost of large lots tends to discourage development or to keep it at a very low density. This type of zoning, however, is not always an effective method for retaining important lands. In areas of intense development interest, land held in an agricultural zone falls prey rather quickly to conversion. Also distinctions are not usually made in the land's capability to support agriculture. So, development often occurs on the best agricultural land.

The concept of exclusive farm-use zones contains the same idea as traditional large-lot zoning, only larger districts are zoned for exclusive farm or agricultural use. By designating large areas for exclusive farm use, the idea is that conversion will be more difficult. Also, farm districts are formed on the capability of the soil and the location of viable farming operations. In many regions, it is possible to have more than one type of agriculture—for instance, irrigated crops, orchards, row crops and rangeland. It is possible to have different exclusive farm-use zones for each crop since the land-use requirements for each are different.

Utility Extension Policies

The construction of roads and major utilities such as sanitary sewers and water systems has a substantial effect on the timing and degree of residential, commercial and industrial development. The expenditure of funds for these purposes can be linked to the preservation of agricultural land. For instance, roads and utilities can be prohibited in the best agricultural areas. These decisions are made on all levels of government, including counties.

Performance Standards

Like many other planning techniques, "performance standards" is a rather broad term that has been defined and applied in several different ways. Basically, the term refers to criteria that are established and must be met before a certain use will be permitted. These criteria, or standards, may be a set of economic, environmental or social factors or any combination of these factors.[16]

[16]For more information about Performance Standards, see *Performance Standards . . . a Technique for Controlling Land Use*, (Special Report 424) which is available from Oregon State University Extension Service, Corvallis, Oregon 97330.

Examples of Local Programs

Suffolk County, New York

Suffolk County is the easternmost county on Long Island, bounded to the north, east and south by water and to the west by Nassau County and adjacent to New York City *(Figure 53)*. Because of this proximity to the nation's largest city, Suffolk County has been under intense development pressure for decades. Still, the county manages to produce an annual cash crop of $100 million (mostly from potatoes and cauliflower) which is the greatest cash crop of any county in New York State (Fletcher 1978).

To protect this threatened resource, the county has developed a program to purchase development rights on its best agricultural land. The initial legislation was approved by the Suffolk County Legislature in 1974. In September of 1976, the county approved a $21 million bond issue to begin the first phase of the program, the purchase of approximately 3,800 acres of farmland. On September 29, 1977, the first contracts were signed with two farmers, Nathaniel Talmage and George Reeves, to purchase their development rights. The ultimate goal of this program is to purchase development rights to about 12,000 to 15,000 acres of the best farmland, or between 30 and 38% of the existing agricultural base. This project is estimated to cost $55 million (Fletcher 1978).

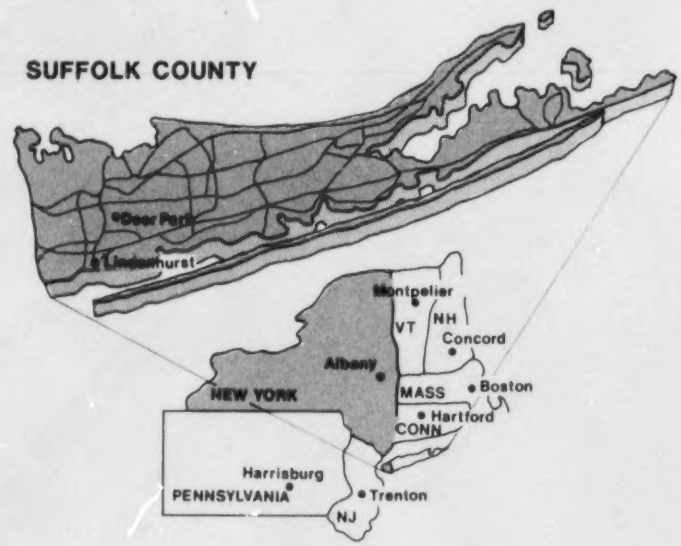


Figure 53 Regional Location of Suffolk County, New York

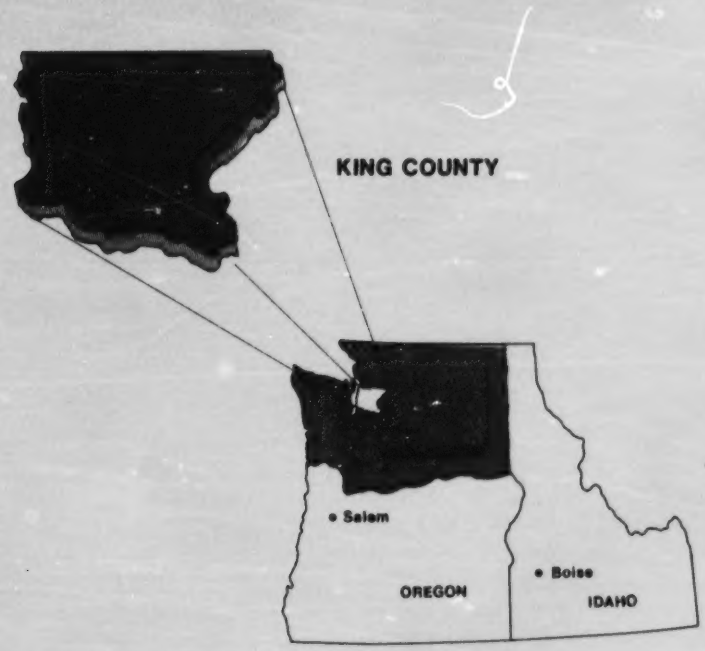


Figure 54 Regional Location of King County, Washington

King County, Washington

Across the nation from Long Island is King County, Washington (*Figure 54*). While they are on different coasts, both have taken the same approach to farmland preservation—transfer of development rights. King County epitomizes both the beauty and the dilemma facing Washington and the Northwest United States. Within its boundaries are the spectacular Cascade Mountain Range, the Snohomish National Forest, a fertile river valley and the Puget Sound waterway. Also located in the county is metropolitan Seattle, which is undergoing skyrocketing growth. One of Seattle's amenities is the Pike Place Market, a crowded farmer's market stocked with fresh vegetables, fruit, fish and meat. The dilemma facing the county is how to maintain a farmer's market without farmers.

After considerable study, the King County Council, under the leadership of County Executive John Spellman, decided that the best way to save their dwindling farmlands was to purchase development rights. Furthermore, they decided the best way to finance the acquisition of development rights was a bond issue which had to be approved by the voters of King County. A state environmental impact statement suggested a positive impact with such a program and negative consequences without it. In November, 1978, a ballot measure to issue $35 million of county bonds for the acquisition of farm and open space lands received 177,984 affirmative votes with 119,912 opposed. The bond issue failed by a fraction of a percentage point of the needed sixty percent majority for validation (Citizens Farmlands Study Committee 1979).

Because the vote was so close and because a majority of the voters favored the issue, a citizens study committee was formed. This committee was to review the 1978 ballot measure, examine changed conditions and available alternatives, and present recommendations on the best way to preserve farmland and related open space (Citizens Farmland Study Committee 1979).

The Committee recommended that the King County Council go back to the voters with a revised ballot issue. It was suggested that the Council submit to the voters a $50 million bond issue for the acquisition of voluntarily offered development rights in the most important remaining farm and open space lands in the county. The committee also identified priority land areas for acquisition. The most important areas were river valleys where farmers were primarily involved in fruit, vegetable, and dairy operations (Citizens Farmlands Study Committee 1979).

On September 19, 1979, this second ballot measure was taken to the King County voters. This time the vote was 3 to 1 in favor of the bond issue. Unfortunately, only 21.5% of the registered voters voted and 22% are needed to validate an election in Washington State. Finally, on November 6, 1979, on the third attempt, all the technicalities were overcome and the bond issue overwhelmingly passed. The vote was significant because, in this era of tax rebellions, the King County citizens voted for more taxes to protect their farmland.

Lancaster County, Pennsylvania

The state of Pennsylvania's efforts to preserve its farmland have largely concentrated on taxing policy. Like similar efforts in Washington, these efforts have proven to be largely ineffective. There is additional legislation passed in 1968 which allows municipalities to acquire property to preserve open space or farmland. This law, Act 422, has not been used effectively for several reasons. One county that has begun to utilize this law in a unique, and seemingly effective, way is Lancaster County.

Lancaster County is located in the heart of the "Dutch" country of southeastern Pennsylvania *(Figure 55)*. Hardy Mennonite farmers take great pride in their stewardship of the land. They have lived and prospered for nearly 300 years. It is the most productive agricultural

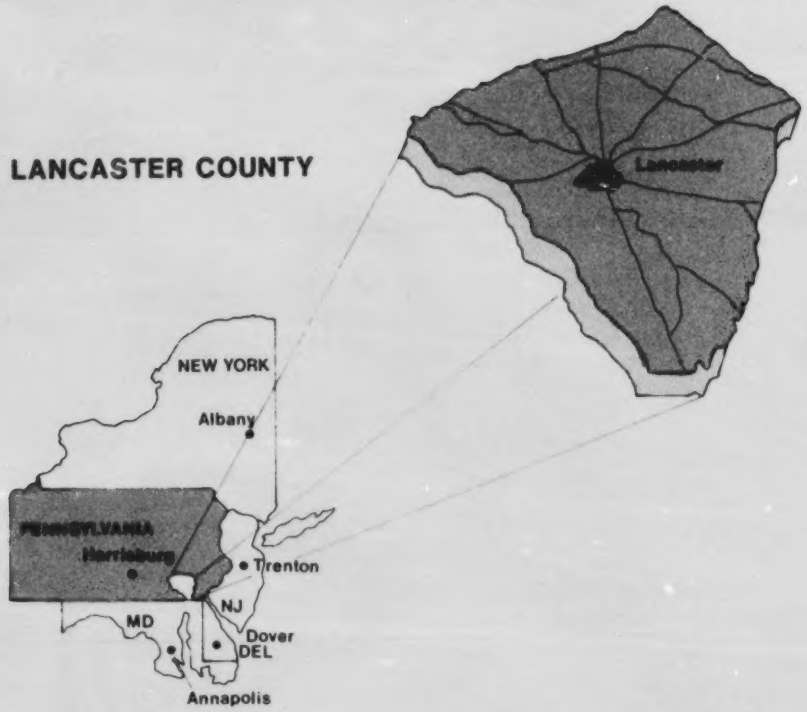


Figure 55 Regional Location of Lancaster County, Pennsylvania

county in Pennsylvania. One-sixth of the state's farm production is in Lancaster. The county leads the state in the production of swine, cattle and calves on farms, cows in milking herds, chickens (except broilers), milk, eggs, corn, tobacco, and hay. It also ranked high in the production of wheat, barley, sheep, potatoes and peaches. And, Lancaster's leadership is not restricted to Pennsylvania. In terms of value of production, it is first among all counties east of the Mississippi River and first among all non-irrigated counties in the United States (Agricultural Preservation Task Force 1979). However, its location between Philadelphia and Harrisburg has resulted in considerable development pressure.

Alarmed at the loss of farmland, Lancaster County's Board of Commissioners organized an Agricultural Preservation Task Force to work with the county planning staff on the issue. This task force recommended in February of 1979, the adoption of a deed restriction program. The goal of this program is to voluntarily obtain deed restrictions on farmland so that it will be preserved solely for agricultural production. It was recommended that this program be administered

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by an Agriclutural Preserve Board, appointed by the commissioners (Agricultural Preservation Task Force 1979).

While a substantial deed restriction can be initiated under the existing State Act 442, the law permits counties to acquire any interest in real property by purchase, contract, condemnation, gift, devise or otherwise, for a number of purposes, including to protect and conserve farmlands. The law, however, has several flaws, so some legislative changes are being sought in order to permit a more comprehensive deed restriction program (Agricultural Preservation Task Force 1979). These changes are being sought through an organized effort of several southeastern Pennsylvania counties concerned about this issue.

York County, Pennsylvania

York County is next to Lancaster both in agricultural production in the state and geographically (*Figure 56*). After considerable study, York County decided to develop agricultural zones in each of its townships. They decided to allow single-family housing development on a "sliding scale" based on the size of the tract of land and its physical characteristics. Each township in the county was given the responsibility to develop criteria for sliding scales through public meeting.

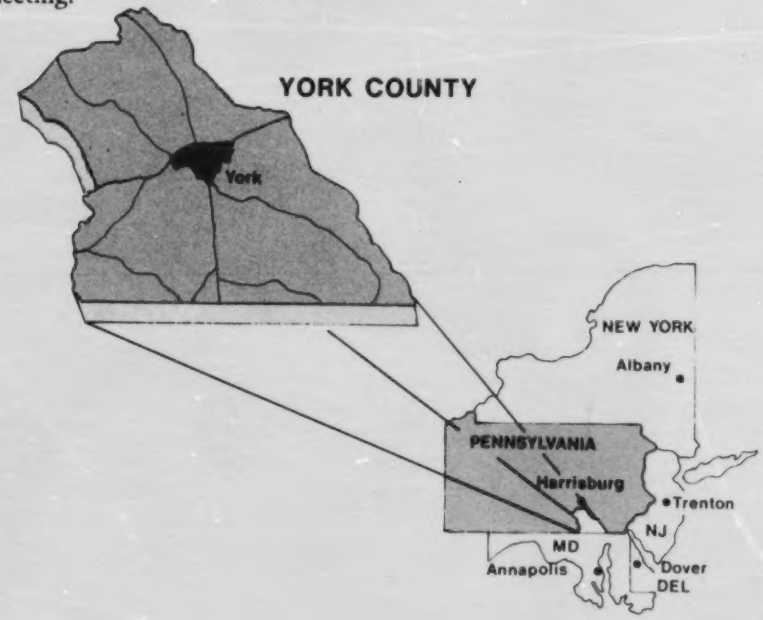

Figure 56 Regional Location of York County, Pennsylvania

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Peach Bottom Township, for example, developed the following criteria for single-family housing in an agricultural zone. These criteria are outlined in *Table 3*. As can readily be seen, Peach Bottom Township relies heavily on soil capability units for determining the location of housing. Rock outcroppings, swamps, densely wooded areas, and steep slopes are also considered.

Table 3

PEACH BOTTOM TOWNSHIP SLIDING SCALE

(a) There shall be permitted on each tract of land the following number of single-family dwelling units:

Size of Tract of Land	Number of Single-Family Dwelling Units Permitted
0- 7 acres	1
7- 30 acres	2
30- 80 acres	3
80-130 acres	4
130-180 acres	5
180-230 acres	6
230-280 acres	7
280-330 acres	8
330-380 acres	9
380-430 acres	10
430-480 acres	11
480-530 acres	12
530-580 acres	13
580-630 acres	14
630-680 acres	15
680-730 acres	16
730-780 acres	17
780-830 acres	18
830 acres & over	19

(b) New single-family dwelling units shall be located on lots in soil capability units III e-3 through VII s-2, as classified by the Soil Survey of York County, Pennsylvania, Series 1959, No. 23 issued May 1963, or on lots of lands which cannot feasibly be farmed, (1) due to existing features of the site such as rock outcroppings, swamps, the fact that the area is heavily wooded, or the fact that the slope of the area exceeds fifteen (15) percent or (2) due to the fact that the size or shape of the area suitable for farming is insufficent to permit efficient use of farm machinery. Where such location is not feasible, permits shall be issued to enable dwelling units to be located on lots containing higher quality soils. However, in all cases such residential lots shall be located on the least agriculturally productive land feasible, and so as to minimize interference with agricultural production.

(c) A lot on which a new dwelling is to be located shall not contain more than one (1) acre, unless it is determined from the sub-division plan submitted by the property owner that the property owner has sufficient land of the type described in paragraph (e) of this section to justify using more than one (1) acre for the location of the proposed dwelling unit, or that the physical characteristics of the land itself require a lot size in excess of one (1) acre.

(d) A property owner submitting a subdivision plan will be required to specify on his plan which lot or lots shall carry with them the right to erect or place any unused quota of dwelling units his tract may have.

(e) Lots for the location of single-family dwelling units in addition to those authorized by subparagraph (a) may be permitted provided that all of the new dwelling units permitted by subparagraph (a) and all the additional new dwelling units are located on lots which are located:
1) On land in soil capability units IV e-5 through VII s-2 as classified by the Soil Survey of York County, Pennsylvania, Series 1959, No. 23 issued May, 1963; or
2) On lands which cannot feasibly be farmed:
(a) due to the existing features of the site such as rock outcroppings, rock too close to the surface to permit plowing, swamps, the fact that the area is heavily wooded, or the fact that the slope of the area exceeds fifteen (15) percent; or
(b) due to the fact that the size or shape of the area suitable for farming is insufficient to permit efficient use of farm machinery.

Such additional lots must meet all the requirements of the Ordinance, the Township Subdivision Ordinance and all requirements of the Pennsylvania Deparment of Environmental Resources.

(f) The applicant shall have the burden of providing that the land he seeks to subdivide meets the criteria set forth in this section.

(g) Any landowner who disagrees with the classification of his farm or any part of it by the Soil Survey of York County, Pennsylvania, Series 1959, No. 23, issued May, 1963, may submit an engineering analysis of the soils on the portion of the farm which he seeks to have reclassified, and if the Board of Township Supervisors finds his study correct, it shall alter the Township Soil Map to reflect the results of such analysis.

Black Hawk County, Iowa

The John Deere Manufacturing Company is located in the city of Waterloo, Iowa. Waterloo is a growing regional urban center in northeastern Iowa. It was growing into the surrounding fertile corn fields of Black Hawk County (*Figure* 57). In 1971, county officials, working with the Iowa Northland Regional Council of Governments, began to address its growth problems through a planning process that culminated in 1973 with a county zoning ordinance. This ordinance has as a primary tenet the preservation of its agricultural land (Clark, no date).

Like many of the other state and local governments attempting

agricultural preservation programs, Black Hawk County used the standard SCS soil survey in its zoning ordinance. Black Hawk County added an innovation, the soil types were rated for their relative long-term ability to produce corn and other crops. This system was named the Crop Suitability Rating (CSR), though it is more popularly known as the "Corn" Suitability Rating. CSRs range from 5-100. County officials decided those soil types receiving a ranking of 70 or better would be considered "prime." These soils will yield an approximate average of 115 bushels or higher of corn per acre. Using this criteria, 68% of the county has prime soils (Clark, no date). For those soils with a CSR of above 70, there is a 35-acre minimum on development.

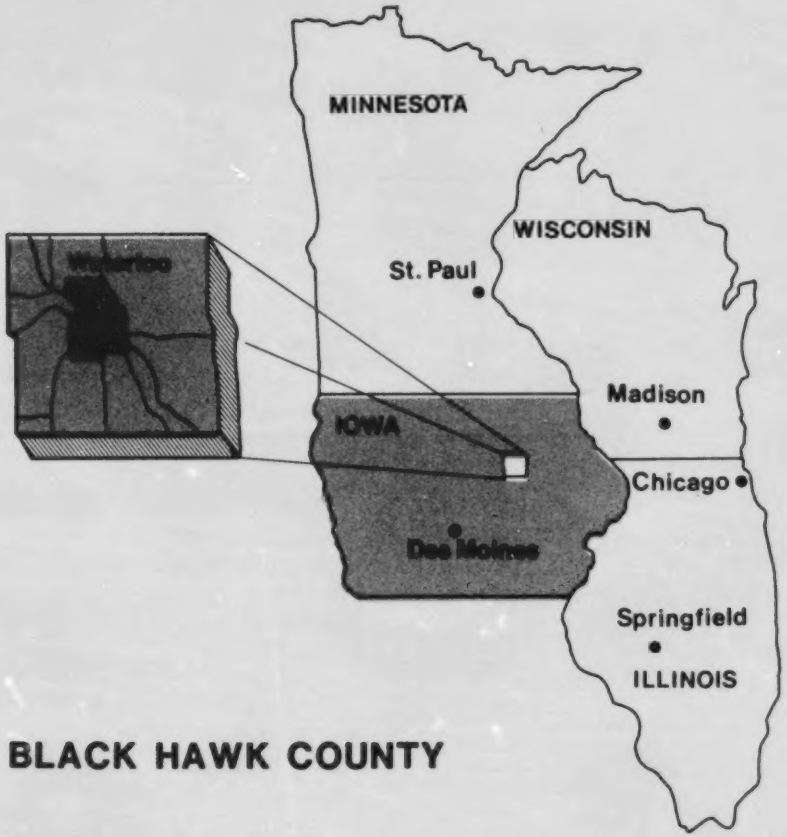

Figure 57 Regional Location of Black Hawk County, Iowa

Black Hawk County also addressed the issue of allowing some people the opportunity to live in the country and completed a rural living study. Planners discovered 15 soil types with a CSR of 70 and below that also had very few limitations for development. A zoning ordinance was then developed to allow rural housing on these soils with a minimum three-acre lot size (Iowa Northland Regional Council of Governments 1975).

This system is working well, and the regional council has expanded its use to the other five counties in its jurisdiction. In the years since the implementation of their zoning ordinance, a major redirection in land use has occurred within Black Hawk County. As the late planner, Janice Clark, who was one of the principal individuals responsible for the ordinance, observed:

> *"The rate of residential development within the unincorporated areas has remained fairly steady, but this development is now occurring on soils deemed suitable for such land use, while the vast majority of land in the county remains in agriculture production." (Clark, no date).*

Efforts by Private and Professional Organizations

In addition to the efforts of the federal, state and local governments, several private and professional organizations have become interested in the issue of agricultural land preservation. A partial listing of national organizations includes the Soil Conservation Society of America, the National Trust for Historic Preservation, the National Association of Counties, Rural America, the American Planning Association, and the American Land Forum. There have also been numerous local groups involved in agricultural preservation and conservation. One such organization is the Brandywine Valley Association in Pennsylvania. While the work of all these groups is noteworthy, it would be helpful to review the efforts of the Soil Conservation Society, the National Trust, and the Brandywine Valley Association.

The Soil Conservation Society of America is a nonprofit scientific and educational organization, founded in 1943. It is dedicated *"to promoting the science and art of good land use, with emphasis on the conservation and management of soil, water, air, and related natural resources, including trees, grass, fish, wildlife and all other forms of beneficial plant and animal life."* Its approximately 15,000 members came from both the United States and Canada and represent a wide variety of backgrounds. The Society's bimonthly publication, the

Journal of Soil and Water Conservation, consistently publishes thoughtful editorials, feature and research articles, and book reviews dealing with land use. Many of these articles have been concerned with agricultural land preservation and ecological planning.

The National Trust for Historic Preservation is a private, nonprofit organization chartered in 1949. Its goal is to help protect America's historic and cultural heritage, and its membership includes more than 165,000 individuals and 1,600 organizations. The National Trust has a long, distinguished history of preserving buildings. Recently, its interests have broadened to include landscapes. The National Trust has started several projects aimed at four inseparable goals: (1) preserving architecturally significant buildings, structures and villages integral to the countryside, (2) protecting the countryside itself, (3) encouraging compatible economic development that can assure the viability of rural areas and (4) promoting the well-being of the present population of these areas (National Trust for Historic Preservation 1979).

The Brandywine Valley Association is a local group organized in 1945 in Chester County, Pennsylvania. Its 1600 members are interested in improving, conserving and restoring the natural resources of the Brandywine River Valley. This group is a model of a locally based group with a long-term commitment to preserving their rural heritage. With a small professional staff, it urges and helps the people of Chester County "unite their efforts to make the Brandywine Valley a more pleasant and profitable place in which to work and live through education and promotion."

These are but a few of the many private groups and organizations interested in the issue of agricultural land retention. Such private groups offer an alternative to government intervention.

Alternatives for Whitman County, Washington

Through the luck of nature, Whitman County is blessed with Palouse soils which are among the finest in the world for the production of winter white wheat, peas and lentils. The county is also blessed with hard-working farmers who have assumed the economic risks and long hours necessary for modern agriculture. Preserving this resource has become a goal of this region's elected officials. This goal was articulated in the county's comprehensive plan, which has been discussed earlier. The major elements of that plan as they relate to agricultural preservation will now be reviewed in greater detail. Next, the zoning ordinance developed to implement the plan will be reviewed. Finally, what has been learned from the experience of others and what action may be taken in the future will be discussed.

First, it is helpful to again review the agricultural preservation goal in Whitman County's comprehensive plan and the related goals dealing with rural and suburban housing and unincorporated rural communities. Again, and it's worth re-emphasizing, for agricultural land use, it was the county's goal: *"to preserve productive agricultural land and the family farm as the prime economic and social resources of Whitman County by preventing land from being taken out of production by indiscriminate or excessive changes in land use"* (Whitman County Regional Planning Council 1978, p. 25).

This goal was followed by four planning guidelines. The first defined agricultural lands as those which are normally devoted to cultivation for agricultural production including small grains, peas, lentils, grass seed, crops for oil, forage crops as well as land which is devoted to commercial livestock grazing. The second planning guideline stated that residential land use should be kept separate from agricultural lands to the maximum extent feasible to prevent increasing the legal liability of farmers to non-agricultural neighbors. The third planning guideline stated that construction of facilities by state and federal agencies should take into account the impact such projects will have on normal farm and ranch operation. The final planning guideline stated that factors which make it necessary to protect agricultural land include the breakup of large land ownership tracts through indiscriminate planning and subdivision and interference with normal farm practices which may occur when non-agricultural land uses are in close proximity to farm operations (Whitman County Regional Planning Council 1978).

These planning guidelines were followed by four implementation guidelines. The first guideline for implementation stated that the county would prohibit residential subdivision of lands in all unincorporated areas except designated unincorporated communities. The second implementation guideline was to discourage non-agricultural residential land use on agricultural lands. The third guideline was to encourage efforts for additional statutory authority from the state for counties to review all divisions of land on locally designated agricultural land[17] and to provide assurance that normal farm practices on agricultural lands will not be subject to unreasonable restrictions or threats of legal liability. The final implementation guideline was to require all levels of governments and their agencies to consider the impact which their programs and projects may have on agricultural

[17]Presently, land can be divided into parcels larger than the minimum lot size, 20 acres, without any county review.

activities, and to seek to minimize any impacts which may threaten the viability of agricultural activity and the family farm (Whitman County Regional Planning Council 1978).

Related to agricultural preservation are the rural and suburban housing and unincorporated communities' goals of the comprehensive plan. The goal for rural housing was *"to provide limited, low-density living opportunities in unincorporated areas on non-agricultural land for individual households whose needs are not addressed by land use opportunities within incorporated areas"* (Whitman County Regional Planning Council 1978). The planning guidelines for that goal essentially establishes performance criteria for rural housing. These are outlined in *Table 4*.

The suburban housing goal simply stated that suburban development would be discouraged outside incorporated areas, except within designated unincorporated communities. To implement this goal, the guidelines suggested prohibition of *all* long plats (subdivisions) and *all* short plats which create more than two parcels of land for new rural housing. The goal that addressed unincorporated communities recognized this role and suggested appropriate planning and zoning for them based on existing character of each community (Whitman County Regional Planning Council 1978).

After the comprehensive plan was adopted by the Board of Commissioners, several important activities occurred while the zoning ordinances were being drafted. First, the rural housing feasibility study (Steiner and Theilacker 1978) was completed which established that there was land in the county that meets the guidelines for rural housing in the plan. This study also suggested performance standards which could be used for siting of such housing. Second, the regional planning council received the Office of Environmental Education grant with the Department of Horticulture and Landscape Architecture of Washington State University and KWSU-TV. This grant enabled a more in-depth ecological inventory of the area, and a more thorough investigation of alternatives for preservation. The grant also financed trips for Whitman County officials and farmers to other regions with successful programs so they could meet with officials and farmers to discuss their efforts. The Agricultural Preservation Technical Advisory Committee comprised of farmers, elected and appointed officials, scientists, and interested citizens was organized to discuss this issue and review the county's efforts. KWSU-TV produced a television documentary of this process so that these experiences could be shared by others. Continued community workshops were held to explain the county's plan and its relationship to agriculture.

All these efforts were important in formulating the zoning ordin-

Table 4

WHITMAN COUNTY PLANNING GUIDELINES FOR RURAL HOUSING

1. Land suitable for rural residential use are lands adjacent to a state or county road which meet at least two of the following criteria:

(a) Land whose near-surface geology consists of basalt or alluvium or, on slopes of greater than 20%, crystalline rock, all as defined by Water Supply Bulletin No. 26 of the Washington Department of Ecology, *Reconnaissance of Geology and of Groundwater Occurrence in Whitman County, Washington* or any updated version of this document.

(b) Land which is not normally cultivated, used for production of forage, or for commercial grazing of livestock.

(c) Distinct areas of land of 15 acres or less which are of insufficient size, quality and/or accessibility to be efficiently used for agricultural production for income. Distinct means that the area is substantially bounded by natural or man-made features which buffer this land from agricultural lands, such as: wooded areas, steep canyon walls, railroads, surface waters or public roads.

2. Minimum parcel sized sufficient to:

(a) Assure compliance with health regulations for on-site sewage disposal;

(b) Provide adequate acreage for appropriate productive use of rural residential land, such as small numbers of livestock, large gardens, etc.

3. Minimum of 200 feet of frontage on an improved county road (road which has minimum improvements of grading, drainage, and gravel surface).

4. If any perennial surface water passes through or along the property lines of the acreage, a minimum of 200 feet of frontage should be required.

5. Less than 50% of the acreage is a designated flood hazard area (as defined by Federal Flood Insurance Program).

6. For *all* new residential building outside incorporated areas where significant amounts of natural vegetation occur, a maximum amount of irreplaceable wetland vegetation and existing timber should be preserved, for the purpose of

(a) erosion control;

(b) maintenance of critical wildlife habitat;

(c) protecting the natural landscape for the benefit of all residents.

(Whitman County Regional Planning Council 1978, pp. 27-28.)

ances which will be used to implement the goals of the comprehensive plan. The ordinance that addressed the farmland preservation goal was the one which created agricultural districts. These ordinances provided the minimum standards for areas of farmlands including requirements for single-family housing. The intent of this district was that agriculture be the primary use and that all other uses be sited as to minimize their impact on, or conflict with, adjacent agricultural uses (Whitman County Regional Planning Council 1979).

The permitted uses in the agricultural district include agriculture; single-family housing, subject to certain provisions; accessory uses and structures for farming and residential use; cottage industries; rock quarrying, with restrictions; and feedlots, with restrictions. For single-family housing, there are two options. The first is the 20-acre minimum lot size. The second is the rural residential use. For the zoning ordinance, the performance standards for rural residential use were refined through the public hearing process, the rural housing feasibility study, and the Technical Advisory Committee discussions. The refined standards are outlined in *Table 5*.

The agricultural district ordinance also stated that no short plat or subdivision plat for residential use could occur outside of incorporated or designated unincorporated communities. Criteria for unincorporated rural community districts were established in other chapters of the zoning ordinance. Certain conditional uses, subject to county review, were also established in the agricultural district.

The adoption of this ordinance does not solve the problem of agricultural land preservation in Whitman County. Problems exist even with the adopted ordinance. The 20-acre minimum, for instance, does not necessarily protect farmland. For this reason, it is important to review what has been learned to see what future actions may be taken.

What has been learned from the experience of the other regions involved in similar efforts? First, not all the agricultural preservation programs which have been attempted have been successful. Burlington County, New Jersey, for instance, started a purchase of development easements program. Assessments were made of the worth of such easements in several townships which were acceptable to the farmers. But at the last moment, the state legislature balked at appropriating the necessary funds and the program was left in limbo.

The second thing that has been learned is that while a program may be successful in one region, it may not be in another. While transfer of development rights may be the only alternative possible for areas with intense urban pressures like Suffolk, King, Howard and Burlington counties, it is probably not an appropriate approach for more rural counties. Not only are the ecology and the farming industries

Table 5

WHITMAN COUNTY ZONING ORDINANCE FOR RURAL HOUSING[18]

1. Two of the following three conditions must exist:

(a) The subject lot is underlain by basaltic or alluvial surface geology, or if it is underlain by crystalline surface geology, the average slope must be no less than one vertical foot in five horizontal feet. These facts must be verified by reference to the geological map contained in Water Supply Bulletin No. 26, *Reconnaisance of Geology and Groundwater, Occurrence in Whitman County, Washington*, published by the State of Washington, Department of Ecology, and dated 1969. Whenever difficulty exists in the verification of surface geological conditions from this map, reference shall also be made to the maps of detailed soil mapping units maintained by the Soil Conservation Service, which maps shall either indicate or not indicate a pattern of specific soil types which is known to be associated with basaltic, alluvial or crystalline surface geological conditions.

(b) The subject lot has not been cultivated, used for production of commercial forage for sale, commercial grazing of livestock for sale or subjected to any agricultural practice designed to produce a product for sale in the preceding three years.

(c) The subject lot is within a distinct area of land of 15 acres or less which is of sufficience size, quality and/or accessiblity to be efficiently used for agricultural production for income. "Distinct" shall mean that the subject area if substantially bounded by natural or man-made features which buffer this land from agricultural lands, such as: wooded areas, steep canyon walls, railroads, surface waters or public roads.

2. All of the following requirements must be met:

(a) The subject lot must have frontage on an improved county or state road of at least 200 feet. "Improved" shall mean a gravel surface or better.

(b) If a perennial surface water passes through, or along any boundary of the subject lot, there must be at least 200 feet of frontage along such surface water.

(c) Less than one-half of the area of the subject lot shall be in an area of special flood hazard and/or a floodway as designated on the Flood Hazard Boundary Map of the *Flood Insurance Study for Whitman County*.

(d) Construction plans for structures, parking areas and private roads on the subject lot shall leave a maximum amount of existing vegetation undisturbed.

(e) The area of the subject lot shall be less than the minimum area required by the Whitman County Department of Environmental Health to safely accommodate approved water supply and on-site sewage disposal systems.

(Whitman County Regional Planning Council 1979).

[18]New law allows all homes existing at the time of passage to be separated with a lot suitable in size for a septic tank drain field as determined by the County Health Dept. (½ to 2 acres or more). New houses can be built as a conditional use on land suitable for cultivation only if they will be occupied by a person actively engaged in the farming operation. The new house built as a conditional use cannot be sold, leased or rented to a non-farm worker for a period of 10 years.

different, but so are the dynamics of the issue. In more rural counties, the pressure to convert agricultural land may come more from the state or federal government than private developers. Also, in many regions, water may be a more limiting resource than land. Approaches must be adapted to the region. And, whatever approach is taken, one thing is clear, it must be suited to the special ecological character and farming industry of that region.

The third thing learned is that all those groups that have successful programs underway have a number of things in common. These commonalities include:

Citizen support

Both on the county and state levels, successful programs have received strong citizen support. States like Oregon and Wisconsin have been leaders in other environmentally related programs, so it should be no surprise that they have state-wide support for farmland preservation. Likewise, Suffolk, King, Lancaster, York, Black Hawk and Whitman counties all have received citizen support.

A strong agricultural industry

This is related to the first point. Wherever there is a successful program, there remains a strong social unit committed to farming. In Lancaster County, Pennsylvania, Mennonites, who normally shy away from community organizations, were involved in the county's Agricultural Preservation Task Force. Even on Long Island, there remains a thriving potato industry and in King County, a profitable horticultural industry.

The use of coalitions

All the successful programs have used similar coalitions. Most have included active farm groups, county and state extension agents, the area's regional planning agency, conservation districts and the county Soil Conservation Service.

A professional planning agency

Each successful program either has been initiated by or received technical assistance from the professional staff of the local planning agency.

An extensive use of SCS data

Wherever there has been a successful program, either on the state or local level, the local SCS has been involved and SCS data have been used to help determine the best agricultural land or marginal land suitable for rural housing.

The use of state and federal programs

Local groups seeking to preserve agricultural land have taken full advantage of state and federal planning and environmental laws and programs. This has sometimes been difficult because often these programs overlap. Warren Zitzmann, a community planner for the Soil Conservation Service, has computed that there are 63 federal congressional committees and subcommittees that have an interest in or responsibilities for land-use planning, management, and control activities. There are 49 additional public or private organizations concerned with land-use planning, management, and control activities on the national level (Zitzmann 1979). This presents numerous problems for local governments concerned with land-use issues like farmlands preservation.

What can Whitman County do in the future to protect its agriculture land? There are several alternatives. **The first alternative is to do nothing more,** which may not be a bad alternative. Whitman County already has a good agricultural preservation program with its comprehensive plan and zoning ordinance. However, there are several drawbacks such as: the current large-lot requirement of 20 acres for rural housing which remains from the old ordinance; the question of liability of farmers for their normal farming practices (such as spraying, cultivating or harvesting late in the evening or early in the morning, and "barnyard aromas"); the vulnerability to unforeseen state or federal actions and changes in attitude which could conceivably undo much of the work that has already been done in the county.

The 20-acre minimum has three major drawbacks. First, it does not necessarily protect the county's best agricultural land. An individual can purchase a parcel of the area's finest land, put a house in the middle of the property and take the land out of agricultural use. Second, with the price of land rising rapidly in Pullman and elsewhere in the county, subdivisions of 20-acre lots become more feasible. A developer could purchase 500 acres and subdivide it into 25 lots. This could have many deleterious effects on the county's farming community. This could be done even on a smaller scale, with individuals purchasing twenty-acre parcels throughout the county. Third, the county has no review authority over lots over 20 acres.

Because of Washington State case law, farmers are liable for damage to their neighbor's property. In one Washington case,[18] a farmer

[19] *Langan vs. Valicopters, Inc.*

who sprayed his crops was liable to damage done to a neighbor's organic garden. The produce of the organic garden was still edible and marketable, but could not be sold as organic. The farmer was liable for the damaged organic produce. Recently, the state legislature has enacted a nuisance law to help protect farmers continue normal agricultural practices. Whether this resolves the liability issue is in some doubt. Probably conflicts will be resolved on a case-by-case basis.

Even though Whitman County's existing plan is a good one, it is still vulnerable to various state and federal actions. The Army Corps of Engineers provided a "good" example. As many people in the county are well aware, if the Corps decides to build a project like a pumped storage facility over good wheat land, then it is a difficult procedure for local residents to prevent it.

The county's plan is also subject to changing attitudes. As Harry Wegner observed, "Political winds change and who knows, we could have a group of commissioners elected some day who would want to scrap all our efforts."

The second alternative is to do nothing locally, but encourage state and federal agricultural preservation efforts. This is to leave the local planning and zoning as they are, accepting the drawbacks, while encouraging state and/or federal efforts to preserve farmland.

There are several state and/or federal actions which could help improve Whitman County's efforts. Washington State officials have, in fact, been looking into efforts to preserve agricultural land. The House Agricultural Committee has been most active and has enacted some legislation, such as that addressing LID's and nuisances, and has explored other possibilities.

State legislation can be sought for the additional statutory authority for counties to review all divisions of land on locally designated agricultural land. On the state level, a task force could be formed to study the issue further and to coordinate the efforts of the various state agencies whose decisions affect agricultural land. Additional state legislation could be sought to connect planning and zoning with preferential tax assessments, as in Oregon and Wisconsin. A further step would also require a conservation plan for preferential taxing, as in Wisconsin. Many farmers who would like to practice better conservation are prevented from doing so because they are actually indirectly penalized by government programs. Since preservation of farmlands depends on there being good soil to preserve, conservation is a necessity.

Congressman James Jeffords has elaborated on this conflict in federal policy:

> *"Historically, our commodity support programs and soil conservation programs have, to some extent, operated at cross purposes. As wheat and feed grain prices rise as they did during 1973 and 1974, for example, farmers are encouraged to plant from fence row to fence row. With the resulting surplus and lowering of prices, much acreage is then removed from production and exposed to the forces of erosion.*
>
> *In this cycle, the government gets caught at both ends, it pays the supports to farmers to plant more wheat and seed grains, even on marginal land that should never have been brought into production. Then it pays farms to carry out conservation practices, to preserve the topsoil when land is retired from production because of surplus" (1979, p. 159).*

Several provisions of the Magnuson-Jeffords bills offer potential advantages to the county. These include, first, the requirement of federal projects to recognize important farmland and, second, provide various demonstration projects and technical assistance. Whitman County has, in fact, already completed a demonstration project which could be used as a model for other communities. Technical assistance could be used in helping to implement the county's plan and ordinance. For instance, the local SCS office could be used even more extensively to help monitor performance standards for rural housing.

If state or federal legislation is not passed, the county can still take advantage of existing programs. For instance, the state and federal Environmental Policy Acts may be used to protect farmlands. The county can designate as "environmentally sensitive" all the agricultural land that the SCS has identified as prime, unique and of statewide importance. The SCS and other USDA agencies should continue to be used for technical assistance. In addition, research from Washington State University can be used to modify county planning. Results from the National Agricultural Lands Study may also prove helpful.

The third alternative is to make changes locally, but to do nothing on the state or federal levels. This alternative is to make changes locally, while doing nothing on the state or federal levels, accepting the various drawbacks of existing state and federal programs. The local action that can be taken includes modifying the zoning ordinance to change the 20-acre minimum requirement and continuing education of the community concerning the importance of farmlands preservation.

The 20-acre minimum could be replaced with either a larger lot zoning or an exclusive farm-use zone. A larger minimum that recognizes the size required for a successful wheat farm in the Palouse could help to insure the protection of the region's best land. This minimum could range anywhere from 400 to 1000 acres, reflecting the size of Whitman County farms. The other option would be an exclusive

farm-use district that included no minimum lot size. All land would be used for agriculture, except those required for farming operations and those meeting the performance standards for rural residential land use. A similar district could be created for the county's rangeland. The success of this option depends on continued close cooperation among the regional planning office, the SCS, the health department and the county prosecutor to insure the established environmental criteria are met. Continued support is also necessary from the county commissioners, the planning commission, and the people of the county.

A continuing education effort should also be undertaken to avoid changes in attitudes which could endanger farmland. This effort should include presentations to various community groups by county commissioners, planners and SCS and by Washington State University faculty and extension service concerning the importance of agricultural preservation. The Brandywine Valley Association provides an example of an on-going educational effort concerned with the importance of agricultural land. By meeting with all types of citizen groups, citizens become better informed about the democratic process of planning and planners gain a better understanding of the community.

The final alternative is to take action both locally and on the state and federal levels. Whatever else is done, continued planning is ncessary. The county's comprehensive plan recognizes in its introduction that it will have to be revised in five to eight years. As the region changes, the county's planning efforts will need to reflect these changes.

The National Farmer's Organization has an automobile bumper sticker that reads: "Agriculture—The Only Essential Industry." The essential elements of this essential industry are suitable land, a favorable climate and market, most importantly, the people to work this land. Through the democratic process, which planning is a part of, our best agricultural land, our most valuable national resource, can be preserved for future generations to cultivate and harvest.

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Glossary of Ecological Planning Terms

Abiotic: the non-living elements of the environment.

Adaptation: a genetically determined characteristic that enhances the ability of an organism to better adjust to its surroundings.

Adiabatic lapse rate: a variation in temperature of a parcel of air up or down a change in elevation. This does not take into account exchanges of heat between the air parcel and the environment.

Advection: the transfer of an atmospheric property due to mass air motion along a gradient of the property in question; the horizontal spreading of local effects by wind.

Aestivate: to exist in a state of torpor throughout the summer months.

Air inversion: the process where warm air masses override cold air trapped in broad basins and valleys.

Air mass: a widespread body of air that gains certain characteristics while set in one location. The characteristics change as it moves away.

Air parcel: a space of air over a certain area of land.

Albedo: reflected solar radiation factor.

Alluvium: the soil material deposited by running water.

Aquifer: a water-bearing layer of permeable rock, sand or gravel.

Aspect: orientation towards some direction.

Basalt: a dark, fine-grained igneous rock, caused by volcanism.

Base map: a reproducable map used to display various types of information.

Biogeochemical cycles: mineral and nutrient cycles which are of importance to the biological community.

Biological: those aspects dealing with living matter.

Biomass: the amount of living matter in a given unit of the environment.

Biophysical: biological and physical factors.

Biosphere: the portion of earth and its atmosphere that can support life.

Biota: all living organisms that exist in an area.

Biotic community: an assemblage of plants and animals that live in the same community, forming a system that is mutually sustaining and interdependent, and is influenced by the abiotic factors of the ecosystem. A biotic community is generally characterized by the dominant vegetation.

Calcareous soil: the soil containing sufficient calcium carbonate to effervesce visibly when treated with cold 0.1 molar hydrochloric acid.

Canopy layer: the uppermost layer of forest vegetation.

Carnivores: animals which feed on other animals.

Carrying capacity: 1. In recreation, the amount of use a recreation area can sustain without deterioration of its quality.

2. In wildlife, the maximum number of animals an area can support during a given period of the year.

3. In ecology, the number of individuals that the resources of a habitat can support.

Catena: a sequence of soils of approximately the same age and derived from similar climatic conditions but have different characteristics due to different relief and drainage.

Clay: the soil particles which are smaller than .002 mm in diameter.

Climate: the set of meteorological conditions characteristic of an area over a given length of time.

Community: 1. In sociology, a variety of physical and social areas and institutions within which and with which people live.

2. In ecology, an association of interacting populations, usually determined by their interactions or by spatial occurrence.

Compensating wind: wind originating above plains and flowing towards nearby mountains along a pressure gradient.

Competition: the use or defense of a resource by one individual that reduces the availability of that resource to other individuals.

Comprehensive plan: a document setting forth official governmental policy for the long-term future development of an area considering all major determinants of growth and change—economic, political, social and biophysical.

Conifer: a cone-bearing plant with needles that remain on the tree all year.

Conservation: the protection, improvement, and use of natural resources according to principles that will insure their highest economic or social benefit.

Contour plowing: farming methods that break ground following the shape of the land in a way that discourages erosion.

Cropland: land regularly used for production of crops, except forest land and rangeland. Permanent pasture is included.

Cross section: a graphic tool which illustrates a vertical section of land.

Deadwater: unflowing stream or river water.

Decomposers: the organisms which breakdown decaying plants and animals.

Decomposition: the breakdown of matter by bacteria. It changes the chemical make-up and physical appearance of materials.

Depletion lenses: a depression in the groundwater level caused by the uptake of water by a well; a cone of depression.

Detritus: freshly dead or partially decomposed organic matter.

Detritus-feeding animals: animals which ingest and breakdown fragments of organic matter.

Detrivores: animals that obtain energy from decaying plant and animal matter.

Dike: hardened lava which extends in a direction other than that of the flow.

Dominant species: a species which has a controlling influence on the local environment.

Drainage area: the area of land between two drainage divides which drain into the same body of water.

Drainage basin: a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Drainage class: the relative terms used to decribe natural drainage are explained as follows:

Excessive: are commonly very porous and rapidly permeable, and have low water holding capacity.

Somewhat excessive: are also very permeable and are free from mottling throughout their profile.

Good: well drained soils that are nearly free of mottling and are commonly of intermediate texture.

Moderately good: moderately well drained soils that commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the surface layers and upper subsoil, and mottling in the lower subsoils and substrata.

Somewhat poor: are wet for significant periods, but not all the time. They commonly have a slowly permeable layer in the profile, a high water table, additions through seepage, or a combination of these conditions.

Poor: are wet for long periods of time. They are light gray and generally are mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Drainage texture: the relative spacing of drainage lines (coarse, medium or fine).

Drainage wind: a wind which flows from a higher elevation to a lower elevation.

Easement: the purchase of partial rights in a piece of land.

Ecology: the relationship of living things to one another and to their physical and biological environment.

Ecological planning: the application of ecological principles to community, regional and resource planning.

Ecosystem: the interacting system of a biological community and its non-living surroundings.

Ecotone: transitional areas between two ecological communities, generally of greater richness and equitability than either of the communities it separates.

Elevation: the height of land (in feet or meters) above sea level.

Energy: that which does or is capable of doing work.

Environment: the sum of all external influences which affect the life, development, and survival of an organism.

Environmental impact statement: a document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals. They are used in making decisions about the positive and negative effects of the undertaking and list alternatives.

Eolian soils: soils which are deposited by the wind.

Erosion: the process of diminishing the land by degrees, by running water, wind, ice or other geological agents.

Erosion, bank: the destruction of land areas from active cutting of stream banks.

Erosion, beach: the retrogression of the shore line of large lakes and coastal waters caused by wave action, shore currents, or natural causes other than subsidence.

Erosion, gully: the widening, deepening, and headcutting of small channels and waterways due to erosion.

Erosion, rill: the removal of soil by running water with formation of shallow channels that can be smoothed out completely by normal cultivation.

Erosion, sheet: the removal of a fairly uniform layer of soil or materials from the land surface by the action of rainfall and runoff water.

Evaporation: the loss of water to the atmosphere from the surface of a soil or a body of water.

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Evapotranspiration: the sum of evaporation and transpiration during a specific time period.

Exotics: plants or animals introduced into a community that are not normally constituents of that community.

Farm: a place operated as a unit of 10 or more acres from which the sale of agricultural products totaled $50 or more annually, or a place operated as a unit of less than 10 acres from which the sale of agricultural products totaled $250 or more annually during the previous year.

Fault: a fracture line along which movement has occurred, causing the geologic units on either side to be mismatched.

Fauna: animal life.

First-order stream: see Stream orders.

Fissure: a crack or narrow opening.

Flood: the general and temporary condition of partial or complete inundation of normal, dry land areas from (a) the overflow of streams, rivers and other inland water, or (b) abnormally high tidal water resulting from severe storms, hurricanes or tsunamis. Also, any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream; or a relatively high flow as measured either by gauge height or discharge quantity.

Flood plain: the area of land adjoining a body of water which has been or may be covered by floodwater.

Floodway: the channel of a river or other watercourse and the adjacent land areas required to carry and discharge a flood of a given magnitude.

Flora: plant life.

Flume: a man-made channel which is used to carry water for power production or crop irrigation.

Fog: suspended liquid particles formed by condensation of vapor.

Food chain: the interconnected feeding relationships of various species which transfer energy from an initial source through a series of organisms.

Forb: herbs other than true grasses, sedges, and rushes; and non-grasslike plant having little or no woody material.

Forest land: land which is at least 10% stocked by trees of any size and land from which the trees have been removed to less than 10% stocking, but which has not been developed for other use.

Frost pocket: a hollow in the topography into which cold air will flow, thereby lowering temperatures in the bottom of the hollow.

Geology: the science which deals with the study of rocks, often in an attempt to learn more about the history of the earth.

Geomorphology: the science which deals with the interpretation of the relief features of the earth's surface.

Grass: plant species with narrow leaves and jointed stems.

Green belts: buffer zones created by restricting development from certain land areas.

Ground cover: plants grown to keep soil from eroding.

Groundwater: water that fills all of the unblocked pores of material lying beneath the water table.

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Groundwater recharge areas: areas where additions are made to an aquifer by infiltration of water through the land surface.

Habitat: the sum of environmental conditions in a specific place that is occupied by an organism, population or community.

Hedgerow: a group or row of trees and shrubs which separate two grassy areas.

Herb: any flowering plant which does not develop a persistent woody stem above ground. Includes forbs, grasses, and grasslike plants.

Herbicide: a chemical that controls or detroys undesirable plants.

Herbivores: primary consumers or animals that obtain energy from plants.

Human ecology: the interdisciplinary study of human-ecosystem relationships.

Humus: the semistable fraction of the soil organic matter remaining after the major portion of added plant and animal residues has decomposed, usually dark-colored.

Hydrograph: a graph which shows the volume of water which passes a point of a stream over a certain period of time.

Hydrologic cycle: a recurring series of events involving the circulation of water through the environment. Includes precipitation, storage, and evaporation.

Hydrology: the science which deals with the study of groundwater and surface water and the changes which occur during the hydrologic cycle.

Indicator species: a species (either plant or animal) which is generally limited to a particular environment, so that its presence will usually indicate that environment or life zone.

Infiltration rate: the rate of speed at which water flows into soil through small pores.

Insolation: incoming solar radiation which is absorbed by the land, largely dependent on landforms and wind direction.

Intrinsic suitability: the inherent capability of an area to support a particular land use with the least detriment to the economy and the environment.

Introduced species: a species which was brought into an area by people; one which is not a native.

Inversion: an atmospheric condition caused by a layer of warm air preventing the rise of cool air trapped beneath it.

Landscape: all the natural features, such as fields, hills, forests, water, etc., which distinguish one part of the earth's surface from another part. Usually that portion of land or territory which the eye can comprehend in a single view, including all its natural characteristics.

Landscape architecture: the design of land.

Land use: the occupation of an area for a particular purpose, such as range land or industrial areas.

Land-use need: a factor which is essential or beneficial for a particular land use.

Langley: a measurement of solar radiation equivalent to one calorie per square centimeter over some increment of time.

Leaching: the process by which nutrient chemicals or contaminants are dissolved and carried away by water, or are moved into a lower layer of soil.

Life cycle: the stages an organism passes through during its existence.

Life zone: a biotic region with a distinctive flora and fauna. The region is based on climatic conditions, elevation, and other natural factors.

Limestone: a metamorphic rock which is formed from organic remains.

Limnology: the study of the physical, chemical, meteorological and biological aspects of fresh water.

Loam: a soil mixture of sand, clay, and silt.

Loess: predominantly silt-sized particles which have been transported and deposited by the wind.

Matrix: a graphic tool which plots two groups of interdependent factors against each other (one in rows and one in columns) to show their relationships.

Meandering stream: a stream which follows many "S" shaped curves.

Metamorphic rock: a previously igneous or sedimentary rock that was exposed to conditions that entirely altered its original condition.

Microclimate: the climate from the surface of the earth to a height at which the local effects of the earth can no longer be distinguished from the general climate.

Migratory: animals that periodically pass from one region or climate to another for feeding or breeding purposes.

Morphology: the study of land surfaces.

Multiple use: harmonious use of land for more than one purpose; i.e., grazing of livestock, wildlife production, recreation, watershed and timber production. Not necessarily the combination that will yield the highest economic return or greatest unit output.

Natural selection: the process of survival of the fittest, by which organisms that adapt to their environment survive and those that do not disappear.

Natural system: the biophysical factors, such as geology, soils, and wildlife.

Niches: an area that provides the necessary elements for the existence of a particular organism.

Nutrients: elements or compounds essential to growth and development of living things: carbon, oxygen, nitrogen, potassium and phosphorus.

Omnivores: animals that obtain energy from plants and other animals.

Open space: a relatively undeveloped green or wooded area provided usually within an urban development to minimize feeling of congested living.

Organic: referring to or derived from living organisms. In chemistry, any compound containing carbon.

Organic matter: matter which is derived from living matter.

Organism: any living thing.

Osmosis: the tendency of a fluid to pass through a permeable membrane, as the wall of a living cell, into a less concentrated solution, so as to equalize concentrations on both sides of the membrane.

Parent material: the unconsolidated and chemically weathered mineral or organic matter from which soils are developed.

Perched water table conditions: a layer of soil separated above the saturated zone by an impermeable layer.

Percolation: the downward movement of water in a soil.

Perennial plant: a species of plant which lives longer than two years.

Performance standard: criteria that are established and must be met before a certain use will be permitted. These criteria, or standards, may be a set of economic, environmental or social factors or any combination of these factors.

Preferential tax policies: favorable taxation of land in exchange for an agreement to use that land for a certain use, such as agriculture.

Permeability: the rate of speed which water can move through soil.

Pesticide: any substance used to control pests ranging from rats, weeds, and insects to algae and fungi.

pH: a measure of the acidity or alkalinity of a material, solid or liquid. pH is represented on a scale of 0 to 14, with 7 being a neutral state, 0 most acid, and 14 most alkaline.

Phyllite: a rock similar in composition to silt and schist.

Physical: in ecological planning: geology, physiolography, soils, hydrology and climate.

Physiography: the science which deals with the study of physical features of the land; in particular, slope and elevation.

Planning: the use of scientific and technical knowledge to provide alternatives for decision making.

Plant community: an association of plants characterized by certain species occupying similar habitats.

Plateau: a large, flat area of land which is higher in elevation than some adjacent land.

Primary consumers: herbivores or animals that obtain energy from plants.

Pristine: pure or untouched.

Producers: organisms which can use solar energy to convert inorganic substances into organic substances.

Profile: a graphic tool which shows a portion of the surface of the earth and the features which are on this portion.

Purchase of development rights: the property owner's development interests are relinquished to the purchaser of the rights who will control the use of the land.

Putative species: the species which are expected to occur in an area, based on habitat requirements.

Rain shadow: an area which has decreased precipitation because it is to the leeward side of mountains.

Rangeland: land in grass or other long-term forage growth of native species used primarily for grazing. It may contain shade trees or scattered timber trees with less than 10% canopy. It includes grassland, land in perennial forbs, sagebrush land, and brushland other than sage. The term nonforest range is used to differentiate the nonforest range from the forest range when both are being disscussed.

Recharge: process by which water is added to the zone of saturation, as recharge of an aquifer.

Recharge areas: see Groundwater recharge areas.

Region: 1. an uninterrupted area possessing some kind of homogeneity in its core, but lacking clearly defined limits;
2. a governmental jurisdiction or designation;
3. a frame for multidisciplinary research: a demand for the integration of data from many realms of ecological reality and, therefore, an opportunity for specialists to work together on theoretical conceptions of human ecology as a synthesis.

Regolith: the predominately loose surficial material overlaying bedrock. It is roughly equivalent to what engineers term "soil" and may contain or be capped by a true soil pedon, as used by soil scientists.

Reptiles: scaly, air-breathing vertebrates, such as snakes and lizards.

Resident: animals which remain in one region or climate throughout the year.

Residium: unconsolidated and partly weathered mineral materials accumulated by disintegration of consolidated rock in place.

Resource: a substance or object required by an organism for normal maintenance, growth, and reproduction. If a resource is scarce relative to demand, it is referred to as a limited resource. Nonrenewable resources (such as space) occur in fixed amounts and can be fully utilized; renewable resources (such as food) are produced at a fixed rate, with which the rate of exploitation attains an equilibrium.

Rill erosion: an erosion process in which numerous small channels of only several inches in depth are formed; often occurs on recently cultivated slopes.

Riparian: habitat on the banks of streams, rivers, and lakes.

River basin: the land area drained by a river and its tributaries.

Rubble: a mass of broken stones and rocks, often at the base of a cliff.

Runoff: water from rain, snow melt, or irrigation that flows over the ground surface and returns to streams.

Sand: soil particles which are between .05 mm and 2.0 mm in diameter.

SCS: Soil Conservation Service.

Second-order stream: see Stream orders.

Secondary consumer: carnivore, or animals that obtain energy from other animals.

Septic tank: an enclosure in which the organic solid matter of continuously flowing waste water is deposited and retained until it has been disintegrated by anaerobic bacteria.

Series: see Soil series.

Shale: a sedimentary rock which is formed from tightly packed clays and silts.

Sheet erosion: the removal of a fairly uniform layer of soil from the land surface by runoff water.

Silt: fine soil particles between .05 mm and .002 mm in diameter that can be picked up by air or water and deposited as sediment.

Slope: the incline of the land surface, usually expressed in percentage of slope, which equals the number of feet of fall per 100 feet of horizontal distance. Often slopes are expressed as follows:

0- 3 percent	nearly level
3- 7 percent	gently sloping
7- 12 percent	moderately sloping
12- 25 percent	strongly sloping
25- 40 percent	steeply sloping
40- 70 percent	very steeply sloping
70-100 percent	extremely steeply sloping

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Slope wind: winds flowing up or down slopes along a temperature gradient.
Social: relating to human society and the interactions of the community.
Sociocultural: a combination of the social and the cultural characteristics of an area.
Soil: a natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.
Soil association: soils of different series which are found in the same area.
Soil catenas: soils which have developed from the same parent material, but differ in drainage class due to different locations on a slope.
Soil depth: the depth of soil material that plant roots can penetrate readily to obtain water and nutrients. It is the depth to a layer that, in physical or chemical properties, differs from the overlying material to such an extent as to prevent or seriously retard the growth of roots or penetration of water. The depth classes are: (1) very deep, more than 60 inches; (2) deep, 40 to 60 inches; (3) moderately deep, 20 to 40 inches; (4) shallow, 10 to 20 inches; and (5) very shallow, 1 to 10 inches.
Soil profile: a vertical section of the soil through all of its horizons and extending into the parent material.
Soil series: soils from the same parent material having similar horizon characteristics.
Soil texture: the relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are shown as follows:

GENERAL TERMS		BASIC SOIL TEXTURAL CLASS NAMES
Sandy soils	—Coarse-textured soils	Sand
	Moderately coarse-textured soils	Sandy loan Fine sandy loam
Loamy soils	—Medium textured soils	Very fine sandy loam Loam Silt loam Silt
	Moderately fine-textured soils	Clay loam Sandy clay loam Silty clay loam
Clayey soil	—Fine-textured soils	Sandy clay Silty clay Clay

Soil types: soils, within a series, which have the same texture.
Solar radiation: the energy from the sun which reaches the earth.
Solum: the upper and most weathered part of the soil profile; the A and B horizons.
Species: a group of closely related organisms potentially able to reproduce viable offspring.

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Species diversity: the number of different species occurring in a location or under the same conditions.
Sprawl: unplanned development of open land.
Stream: a general term for a body of flowing water. In hydrology, the term is generally applied to the water flowing in a natural channel as distinct from a canal. More generally, as in the term stream gauging, it is applied to the water flowing in any channel, natural or artificial.
Stream, ephemeral: a stream that flows only in response to precipitation.
Stream, intermittent: a stream that flows only part of the time or through only part of its reach.
Stream, perennial: a stream that flows continuously.
Stream orders: first-order streams are primary drainageways. Second-order streams are the confluence of two first-order streams. Third-order streams are the confluence of two second-order streams, etc.
Stripcropping: growing crops in a systematic arrangement of strips or bands which serve as barriers to wind and water erosion.
Structures, heavy: a building of generally great weight and size such as a mill or factory.
Structure, light: a building of generally slight weight and size such as a residence.
Subsoil: the B soil horizon; the layer of soil below the layer in which grass roots normally grow.
Substrata: a lower layer of bedrock or soil.
Succession: the orderly and progressive replacement of one community by another until a relatively stable community occupies an area.
Swales: elongated depression in the land.
Synthesis: the combining of all of the parts to form an interrelating whole.
Talus: the rock debris which has piled up at the base of a cliff.
Temperature gradient: the difference in temperature along some horizontal distance, or up a vertical parcel of air.
Terracing: dikes built along the contour of agricultural land to hold runoff and sediment, thus reducing erosion.
Third-order streams: see Stream orders.
Topography: the physical features of a surface area, including relative elevations and the position of natural and manmade features.
Transfer of development rights: the development rights are purchased to be used in another location, thereby separating the development rights from the land itself.
Transpiration: the loss of water to the atmosphere from plants.
Tree: a woody, perennial plant with a single main stem.
Trophic levels: the different levels through which energy flows from producers to consumers.
Understory: herbs and shrubs which grow beneath a forest canopy.
USGS map: United States Department of Interior Geologic Survey map.
Valley wind: winds flowing up or down valleys along temperature gradient.
Vegetation: plant life; trees, shrubs, herbs and grasses.
Ventilation: the circulation of fresh air across the land, largely dependent on landforms and wind direction.

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Voluntary covenants: agreements that limit what can be done with property.

Water: a transparent, ordorless, tasteless liquid, a compound of hydrogen and oxygen, H_2O freezing at 32°F and 0°C and boiling at 212°F and 100°C, which in more or less impure state, constitutes rain, oceans, lakes, rivers, and other such bodies; it contains 11.188 percent hydrogen and 88.812 percent oxygen, by weight.

Water balance: the radio of water lost from a system and brought into a system.

Watershed: a drainage area separated from other drainage areas by a dividing ridge.

Water table: the upper surface of groundwater, or that level below which the soil is saturated with water.

Wildlife: animals which are neither human or domesticated.

Xerophyte: a plant which requires a low supply of moisture.

Zoning: land-use controls such as limiting the use to which land in each area may be put, minimum lot size, building types, etc. Includes variances, special-use permits, and other zoning flexibility devices.

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Selected Bibliography of Ecological Planning and Agricultural Preservation Resources[19]

The Earth Sciences and Planning

Geology

General Texts

1. Bates, Robert L., Walter S. Sweet and Russel O. Utgard. 1973. *Geology: An Introduction.* Lexington, MD: D. C. Heath and Company. 541 pp. Library of Congress Card No. 72-3584.

   A basic textbook of physical and historical geology, this book is easily understood by the introductory college-level student, is well illustrated, contains selected references, and includes a glossary of geology terms.

2. Cooke, R. V. and J. C. Doornkamp. 1974. *Geomorphology in Environmental Management.* Oxford, England: The Clarendon Press. 413 pp.

   This geomorphology text pays special attention to relationships between geomorphology and environmental management. Excellent discussions of landforming processes, floods and floodplains are included.

3. Flawn, Peter T. 1970. *Environmental Geology: Conservation, Land-Use Planning and Resource Management.* New York, NY: Harper and Row. 313 pp. Library of Congress Catalog Card No. 75-103915.

   A textbook of environmental geology, emphasis is placed in this work on earth processes, earth resources, and engineering properties of rocks and surface deposits. Valuable chapters are included on engineering considerations, people as geological agents, the application of geological data, and a case study of the use of geologic information for planning in Austin, Texas.

4. Hunt, Charles B. 1972. *The Geology of Soils: Their Evaluation, Classification, and Uses.* San Francisco: W. H. Freeman and Company. 344 pp. Library of Congress Catalog Card No. 71-158739 *(see 18)*

5. Strahler, Arthur N. 1970. *Introduction to Physical Geography.* New York, NY: John Wiley and Sons, Inc. 547 pp. Library of Congress Catalog Card No. 73-91648.

   The discipline of physical geography touches upon many topics which are revelant to planning, including cartography, geomorphology, physiography, soils and climate. This book is a classic text of physical geography which has much basic information on all these topics.

6. Upton, William B., Jr. 1970. *Landforms and Topographic Maps.* New York, NY: John Wiley and Sons, Inc. 134 pp. Library of Congress Catalog Card No. 73-107592.

   Basic principles of how to use topographic maps, and how to identify landforms on topographic maps are explained in this book. Examples of topographic mapse are provided for each state, and landforms found on each map are listed. These maps, used in conjunction with glossary of terms, provide an ideal learning method for landform identification on topographic maps.

7. Way, Douglas S. 1973. *Terrain Analysis: A Guide to Site Selection Using Aerial Photographic Interpretation.* Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc. 392 pp. Library of Congress Catalog Card No. 72-76543.

   This book introduces concepts of terrain analysis, placing an emphasis on aerial photographic interpretation methodologies for site selection. Chapters are included on land forms and aerial photographic terrain analysis, processes of physical geology, soils, data acquisition and sources, issues of site development, sedimentary, igneous and metamorphic rock types, and glacial eolian and fluvial landscapes.

Methods of Inventory and Analysis

8. Hilpman, Paul L. and Gary Steward. 1969. "Geology and Concern for the Environment," *Highway Research Record*, Vol. 271: 38-47.

   This is a good introductory article on the use of geologic information for planning. Applications of geology to urban problems, factors used in making geologic maps for planning and suitability maps and a geologic cross section with interpretations are included.

9. Pessl, Fred, Jr., William H. Langer and Robert B. Ryder. 1972. *Geologic and Hydrologic Maps for Land Use Planning in the Connecticut River Valley.* Washington, D.C.: U.S. Geological Survey, Geological Survey Circular 674. 12 pp.

   This brief report outlines the USGS Connecticut Valley Urban Area Project which was designed to develop a series of "resource characteristics" maps which could be applied to planning. This project served as a predecessor to subsequent similar efforts on a nationwide scale.

10. Turner, A. K. and D. M. Coffman. 1973. "Geology for Planning: A Review of Environmental Geology," *Quarterly of the Colorado School of Mines.* Golden, CO: Colorado School of Mines. Vol. 68, No. 3. 127 pp. Library of Congress Catalog Card No. 74-151722.

    This booklet is an excellent discussion of the evolving role of environmental geology in planning. Emphasis is on the utilization of geologic information for planning purposes and discussion of the revisions of geologic mapping processes to meet planning needs are included.

Bibliographies

11. Clark, Paul F., Helen E. Hodgson and Gary W. North. 1978. *A Guide to*

[19]This bibliography was compiled largely by Richard Beach under the direction of Kenneth Brooks and myself. This investigation was supported in part by funds provided by the Washington State University Research and Arts Committee. Additional bibliographic information concerning agricultural preservation was compiled by John Theilacker and myself. More extensive versions of both bibliographies are available from Vance Bibliographies, PO Box 229, Monticello, IL 61856.

Obtaining Information from the U.S.G.S. 1978. Arlington, VA: U.S. Geologic Survey, Geological Survey Circular 777. 36 pp.

This is an invaluable pamphlet containing instructions for obtaining various publications and other products of the USGS including specific earth resources data and maps.

12. U.S. Department of the Interior. 1977. *Annotated Bibliography of Natural Resource Information.* Washington, D.C.: Fish and Wildlife Service.

This is a series of 5 volumes of annotated bibliographies done in energy-related environmental test areas in New Mexico, Utah, Wyoming, Montana, North Dakota, and Colorado. References are listed under the general topics of geology, hydrology, topography, land use, mineral resources, vegetation and wildlife.

Soils

General Texts

13. Brady, Nyle C. 1974. *The Nature and Property of Soils.* New York, NY: MacMillan Publishing Co. 639 pp. Library of Congress Catalog Card No. 73-1046.

A classic soils textbook presents the basics of soil science, and includes a glossary of soil terms.

14. Eyre, S. R. 1963. *Vegetation and Soils: A World Picture.* Chicago, IL: Aldine Publishing Company. 342 pp. Library of Congress Catalog Card No. 63-18442. *(see 65)*

15. Fitzpatrick, E. A. 1971. *Pedology: A Systematic Approach to Soil Science.* Edinburgh: Oliver and Boyd Publishers. 306 pp.

A fairly comprehensive general text which covers the basics of soil science. This book has some added interest since it discusses soil classification using the British soils classification system.

16. Hausenbuller, R. L. 1972. *Soil Science: Principles and Practices.* Dubuque, IA. Wm. C. Brown Company. 504 pp. Library of Congress Catalog Card No. 78-164488.

This is a good introductory reference to soil science, covering in depth topics of soil formation and development, composition and basic management techniques. The new edition has additional material on soil engineering capabilities, which would be of particular interest to the planner, landscape architect, architect and engineer.

17. Hudson, Norman. 1971. *Soil Conservation.* Ithaca, NY: Cornell University Press. 320 pp. Library of Congress Catalog Card No. 76-160152.

The planner in agricultural regions will find that soil conservation is frequently, if not always, an issue. Ecological planning offers some useful approaches for the identification of problem soils which may be prone to erosion or drainage problems. Proper understanding of soil conservation principles would help guide the planner towards proper utilization of available soils information. This text provides an excellent reference resource for soil conservation principles.

18. Hunt, Charles B. 1972. *The Geology of Soils: Their Evaluation, Classification, and Uses.* San Francisco: W. H. Freeman and Company. 344 pp. Library of Congress Catalog Card No. 71-158739.

The basic properties and processes of soil science are presented in this book with special attention directed towards geological relationships to soils. This approach is valuable in that relationships between environmental factors in the soil-forming environment are stressed.

19. Sheals, J. G. (ed.). 1969. *The Soil Ecosystem: Systematic Aspects of the Environment, Organisms, and Communities.* London: The Systematics Association. 247 pp.

This is a collection of articles from a 1969 symposium. Some are a bit technical for the planner. However, basic problems of research on the soil ecosystem are presented, and papers on the soil environment, problems of soil classification, the agronomic significance of soil mapping units, and the study of soil ecosystems are of direct interest to the planner.

20. Soil Conservation Service. 1964. *Soils of the Western United States.* Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service. 69 pp.

This is a general report on the occurrence and distribution of soils in Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington and Wyoming. The text primarily consists of explanations of the general soils map of this region, descriptions of 36 great soil groups, and eight miscellaneous land types.

21. Strahler, Arthur N. 1970. *Introduction to Physical Geography.* New York, NY: John Wiley and Sons, Inc. 457 pp. Library of Congress Catalog Card No. 73-91648. *(see 5)*

22. U.S. Department of Agriculture. 1957. *Soil.* Washington, D.C.: U.S. Government Printing Office (Yearbook of Agriculture 1957). 784 pp.

This is a classic volume of essays on soils, covering topics in basic principles, soil fertility, soil practices, soil care, soil moisture, classification systems, soil regions, and special uses. Although the book is now somewhat dated, most articles still have some relevance to the understanding of soils; especially relevant are two essays in the "Systems" chapter which discuss soil classification and the use of soil maps.

Methods of Inventory and Analysis

23. Bartelli, Lindo. 1960. "General Soil Maps—A Study of Landscapes," *Journal of Soil and Water Conservation*, Vol. 21: 3-6.

This is a good introductory article on the use of general soil maps for planning. The paper addresses the problems of how much detail is necessary in the soils data to be of use to planners, and how soil phenomena may be used to determine land suitabilities for farming, residence, recreation, industry and transportation.

24. Bartelli, L. J., A. A. Klingebiel, J. V. Baird and M. R. Heddleson. (eds.). 1966. *Soil Surveys and Land Use Planning.* Madison, WI: Soil Science Society of America. 179 pp. Library of Congress Catalog Card No. 66-26147.

This book is comprised of a selection of 19 papers which deal with the use of soil survey information for planning applications. These readings should be of interest to planners who are interested in the use of natural resource data for planning activities. Applications in community planning, urban planning, regional planning, recreation planning, and transportation planning are discussed in the various papers.

25. Bie, Stein W. (ed.). 1975. *Soil Information Systems.* Wageningen, Netherlands: Center for Agricultural Publishing and Documentation. 87 pp.

    This is a short booklet of papers written by members of an international symposium held on soils information systems in 1975. While it is not recommended that this publication be used to locate the whereabouts of any specific soil information system, the book serves as a good introduction to the subject and provides a multi-national overview of the state of this emergent field in 1975.

26. Foth, Henry and Hyde S. Jacobs. 1971. *Field Guide to Soils.* Boston, MA: Houghton Mifflin Company. 38 pp.

    A brief pamphlet which covers basic approaches to the field examination of soils, this book has definite value to the ecological planner who should acquaint himself/herself with general soils field check analyses, and yet does not require a highly sophisticated approach.

27. Johnson, William N. and R. Scott Fifer. 1978. *Water Quality Considerations for Highway Planning and Construction I-70 Vail Pass, Colorado.* Glenwood Springs, CO: U.S. Forest Service. 54 pp. *(see 33)*

28. Klingebiel, A. A. and P. H. Montgomery. 1961. *Land-capability Classification.* Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service, Agriculture Handbook No. 210. 21 pp.

    This handbook outlines the SCS Land-Capability Classification System. This system has, in many areas, become outdated due to technological changes in farming methods which has had the effect of changing many of the criteria which are used to determine a soils designation within the system. However, the land capability class system is still used for some general planning purposes, and this text therefore still holds some value as a guide to system classifications.

29. U.S. Department of Agriculture. 1975. *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys.* Washington, D.C.: Soil Conservation Service, Agriculture Handbook 436. 754 pp.

    This is the definitive, up-to-date soil taxonomy system used by the Soil Conservation Service in the United States. Detailed descriptions of the soil taxonomy classification system, its categories, nomenclature, and explanatory material are included.

30. U.S. Department of Agriculture. 1975. *Revised Soil Survey Manual.* Washington, D.C.: Soil Conservation Service, Agricultural Handbook 18. 200 pp.

    This is the current Soil Conservation Service descriptive survey manual which outliines current soil descriptive terminology. An invaluable aid to field and laboratory studies as well as the interpretation of soil surveys themselves. Intended primarily for the use of soil scientists, this book would be of interest to anyone who must make use of soil survey data.

31. Way, Douglas S. 1973. *Terrain Analysis: A Guide to Site Selection Using Aerial Photographic Interpretation.* Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc. 392 pp. Library of Congress Catalog Card No. 72-76543. *(see 7)*

32. Yanggen, D. A., M. T. Beatty and A. J. Brovald. 1966. "Use of Detailed Soil Surveys for Zoning," *Journal of Soil and Water Conservation,* Vol. 21: 123-126.

    This brief article documents the use of general soils information to help delineate zoning categories spatially in Buffalo County, Wisconsin. It is a good introductory article on the subject of soils information applications of land-use planning, and includes discussion of the classification of general soil types into suitability rankings.

Hydrology

General Texts

33. Johnson, William N. and R. Scott Fifer. 1978. *Water Quality Considerations for Highway Planning and Construction I-70 Vail Pass, Colorado.* Glenwood Springs, CO: U.S. Forest Service. 54 pp.

    This short book outlines permanent and temporary erosion control methods taken on highway sites in Colorado in steep mountainous terrain. Performance evaluations are given for the various methods. As such, the publication is not directly applicable to regional scale ecological planning efforts. However, it is related in that it is a discussion of environmental hazards posed by a specific land use, and possible remedies.

34. Kneese, Allen V. and Blair T. Bower. 1968. *Managing Water Quality: Economics, Technology, Institutions.* Baltimore, MD: The Johns Hopkins Press. 328 pp.

    This book covers the subject of water quality and is subdivided into the following 5 major sections: (1) nature of water quality problem; (2) economic concepts and policies for individual waste discharge control; (3) economic concepts for regional water quality management; (4) institutional and organizational approaches to regional water quality management; and (5) implementation and management.

35. Leopold, Luna B. 1968. *Hydrology for Urban Land Planning—A Guidebook on the Hydrologic Effects of Urban Land Use.* Reston, VA: U.S. Geological Survey. Geological Survey Circular 554. 19 pp.

    This report discusses the effects of urban land use on the hydrologic functioning of drainage basins. Particular attention is paid to the in-

formation needs of the planner, and useful discussion of interconnectedness of environmental variables is included. The report is helpful in that it describes ho whydrologic data is used by the planner to formulate decision analyses and modeling of various alternative actions.

36. Morisawa, Marie. 1968. *Streams: Their Dynamics and Morphology.* New York, NY: McGraw-Hill Book Co. 175 pp. Library of Congress Catalog Card No. 68-12267.

    This is a valuable paperback reference text on stream morphology and processes and is an excellent source of general information on fluvial processes.

37. Soil Conservation Society of America. 1976. *Managing Flood Plains to Reduce the Flood Hazard.* Ankeny, IA: Soil Conservation Society of America.

    This is a reprint of 4 articles which deal with various aspects of flood plain management, which first appeared in the *Journal of Soil and Water Conservation*, Vol. 31, No. 2. Articles included are "A Primer on Flood Plain Dynamics" by Thomas Maddock, Jr., "The Nation's Increasing Vulnerability to Flood Catastrophe" by James E. Goddar, "The Evolution of Approaches to Flood Damage Reduction" by Keith W. Muckleson, and "Flood Plain Management: The Iowa Experience" by Merwin D. Dougal. Collectively these articles provide an excellent introduction to floodplain management problems.

38. Waananen, A. O., J. T. Limerinos and W. J. Kockelman. 1977. *Flood-prone Areas and Land-use Planning—Selected Examples From the San Francisco Bay Region, California.* Washington, D.C.: U.S. Geological Survey, Professional Paper 942. Library of Congress Catalog Card No. 77-77832.

    This report provides valuable discussion of land-use planning for flood prone areas, including definitions of terminologies, how to delineate flood plains, flood loss prevention and reduction areas, planning for flood loss reduction, and case studies in the San Francisco area.

39. Ward, R. C. 1975. *Principles of Hydrology.* Berkshire, England: McGraw-Hill Book Co. 367 pp. Library of Congress Catalog Card No. 74-32444.

    This is an introductory textbook of hydrology which concentrates on describing the occurrence, distribution, and movement of water, and the principle phases of the hydrologicl cycle.

Methods of Inventory and Analysis

40. Cain, John M. and Marvin T. Beatty. 1968. "The Use of Soil Maps in the Delineation of Flood Plains," *Water Resource Research*, Vol. 4: 173-182.

    This is a very useful, brief article which discusses the feasibility of mapping flood plains in areas where the stream regimen has not been appreciably altered by people and where extensive flood plain areas must be mapped by using detailed soil maps rather than conventional field studies methods. The results of the former method are seen to compare well with those of the latter method.

41. Pessl, Fred, Jr., William H. Langer and Robert B. Ryder. 1972. *Geologic and Hydrologic Maps for Land Use Planning in the Connecticut River Valley.* Washington, D.C.: U.S. Geological Survey, Geological Survey Circular 674. 12 pp. *(see 9)*

Bibliographies

42. U.S. Department of the Interior. 1977. *Annotated Bibliography of Natural Resource Information.* Washington, D.C.: Fish and Wildlife Service.

    This is a series of 5 volumes of annotated bibliographies done in energy-related environmental test areas in New Mexico, Utah, Wyoming, Montana, North Dakota, and Colorado. References are listed under the general topics of geology, hydrology, topography, land use, mineral resources, vegetation and wildlife.

Climate

General Text

43. Geiger, Rudolf. 1965. *The Climate Near the Ground.* Cambridge, MA: The Harvard University Press. 611 pp. Library of Congress Catalog Card No. 64-23191.

    Geiger's book is the classical work on microclimate and may even be considered to be the foundation of this particular branch of meteorology. The subject is treated with considerably more depth than would be useful to the ecological planner, yet any questions the planner might have concerning microclimate would certainly be answered here.

44. Oliver, John E. 1973. *Climate and Man's Environment: An Introduction to Applied Climatology.* New York, NY: John Wiley and Sons, Inc. 517 pp. Library of Congress Catalog Card No. 73-5707.

    A basic textbook of climatology, this book may be more useful to the planner than most climatology textbooks in that special emphasis is given to climate and the human environment with discussion of such topics as ventilation, climate and health, climate and architecture and climate and agriculture.

45. Rosenberg, Norman J. 1974. *Microclimate: The Biological Environment.* New York, NY: John Wiley and Sons, Inc. 315 pp.

    This is a very good introductory reference to the science of micrometeorology, which treats thoroughly and concisely all aspects of the climatic environment near the ground, where most biological components of ecosystems are found. The book is more condensed and thus more readable than Gieger's *The Climate Near the Ground*, but is less comprehensive.

46. Sellers, William D. 1965. *Physical Climatology.* Chicago: The University of Chicago Press. 272 pp. Library of Congress Catalog Card No. 65-24983.

A general text on physical climatology, this book places much emphasis on global energy and water balance regimes of the earth and its atmosphere. Accordingly, the book is of some value to persons interested in large microscale climatic relationships. Such relationships, though of little direct practical value to the planner, may help to bring about a more complete understanding of regional climatic phenomena, and thus the book should be included as a general climatic reference for the ecological planner.

47. Strahler, Arthur N. 1970. *Introduction to Physical Geography*. New York: John Wiley and Sons, Inc. 457 pp. Library of Congress Catalog Card No. 73-91648. *(see 5)*

Data Sources

48. Haines, Donald A. 1977. *Where to Find Weather and Climate Data for Forest Research Studies and Management Planning*. St. Paul, MN: U.S. Department of Agriculture, Forest Service, General Technical Report NC-27. 15 pp.

    This is a short pamphlet which outlines meterological data sources, the information contained, and how to obtain the data. The text is illustrated with tables which show what the various data sources consist of and how they may be used.

49. Heinrich, Walter, Elisabeth Harnikell and Dieter Mueller-Dombois. 1975. *Climate Diagram Maps*. Berlin: Springer-Verlag. 36 pp.

    This set of world climate maps represents a novel method for representing regional climate. Climate diagrams, explained in the accompanying text, have been produced for stations around the world and are reproduced on the set of 9 maps (North America, South America, Africa, Australia and New Guinea, South Asia, North Asia, Europe, the Pacific Islands and ecological climatic regions). The maps present an immediate visual understanding of regional patterns of wet and dry seasons, and other climatic extremes.

50. National Weather Records Center. 1969. *Selective Guide to Climate Data Sources*. Asheville, NC: U.S. Department of Commerce, Environmental Data Service. 90 pp.

    This is a short booklet which lists various selected climatic data sources of the Environmental Data Service. The Environmental Data Service is perhaps the single most valuable source of climatic data for the United States, and this publication, which includes prices, ordering instructions and illustrated examples of the various publications offered, is the best summary of available information.

51. Pacific Northwest River Basin Commission. 1968. *Climatological Handbook, Columbia Basin States*. Vancouver, WA: Pacific Northwest River Basins Commission. Three volumes.

    This is a three volume set of climatic data from weather stations in Washington, Oregon, Idaho, Montana, Nevada and Wyoming. Volume I contains temperature data; Volume II contains percipitation data and Volume III contains hourly climate data.

52. U.S. Department of Commerce. Monthly. *Storm Data*. Asheville, NC: National Oceanic and Atmospheric Administration, Environmental Data Service.

    These are monthly publications which document storm occurrences in each state. Data included are date, time, length of path, width of path, number of persons killed or injured, property and crop damage, and nature of storm.

53. U.S. Department of Commerce. Monthly. *Local Climatological Data*. Asheville, NC: National Oceanic and Atmospheric Administration, Environmental Data Service.

    This is a valuable source of climatological data for most major weather stations in the United States. Included are rainfall, temperature and wind data; annual summaries for each station are published as well.

54. U.S. Department of Commerce. Monthly. *Monthly Climate Data for the World*. Asheville, NC: National Oceanic and Atmospheric Administration, Environmental Data Service.

    This publication lists general data for the surface and upper air for selected stations around the world. Not as useful as the more specific NOAA publications, this series may still be of some use for comparative studies of large regions.

55. U.S. Department of Commerce. Monthly. *Hourly Precipitation Data*. Asheville, NC: National Oceanic and Atmospheric Administration, Environmental Data Service.

    This publication summarizes precipitation data for weather stations in each state; separate issues are published for each state. As such, it is probably the best source of precipitation data for most regions in the United States.

56. U.S. Department of Commerce. Monthly. *Climatological Data*. Asheville, NC: National Oceanic and Atmospheric Administration, Environmental Data Service.

    This publication, issued separtely for each state, contains all of the basic climatological data for stations within the state. The publication is composed of data tables, as well as a state map showing weather station locations. This is probably the best climatological data source for individual states.

Limnology and Aquatic Biology

General Texts

57. Hotchkiss, Neil. 1970. *Common Marsh Plants of the United States and Canada*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service. Resource Publication #93. 99 pp. *(see 66)*

58. Shaw, Samuel P. and C. Gordon Fudine. 1971. *Wetlands of the United*

States: Their Extent and their Value to Waterfowl and Other Wildlife. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Circular 39. 67 pp.

This booklet discusses the general problem of conservation of wetlands, including the issue, the history of wetland exploitation, wetland soils, wetlands inventories, the proposed 20 wetlands inventory types, use of wetlands inventories, wetlands and waterfowl, and conclusions.

59. U.S. Department of the Interior. 1970. *National Estuary Study.* Washington, D.C.: Fish and Wildlife Service.

This is a seven volume series which documents the national estuary study. All areas in the United States are covered by the series, which should be of interest to coastal zone planners.

Methods of Inventory and Analysis

60. Golet, Francis C. and Joseph S. Larson. 1974. *Classification of Freshwater Wetlands in the Glaciated Northwest.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service Resource Publication #116. 56 pp.

Land-use planners and natural resource specialists are constantly in need of viable land type classification systems which can provide an environmentally meaningful spatial representation of areas of land, and yet may be utilized within the limited time framework under which many land resource inventory studies must be conducted. This booklet presents one such methodology, a wetland classification scheme which outlines components of various differentiable wetland types, provides common and scientific names of flora and fauna in these representative regions an. proposes methods of application of the system.

61. Wastler, T. A. and L. C. de Guerrero. 1968. *National Estuarine Inventory Handbook of Descriptors.* Washington, D.C.: U.S. Department of the Interior, Federal Water Pollution Control Administration. 85 pp.

The National Estuarine Inventory is a compilation of available information on U.S. Coastal Zones. This book describes the general NEI framework, and uses tables to describe the organization and where data are presented.

Bibliographies

62. U.S. Department of the Interior. 1977. *Coastal Marsh Productivity: A Bibliography.* Washington, D.C.: Fish and Wildlife Service, FWS/OBS-77/3. 300 pp.

This comprehensive bibliography lists references related to coastal marsh productivity, covering topics such as the marsh environment, primary productivity of coastal marsh plants, detritus in the food chain, marsh estuaries as fish havens, and the marsh as habitat and feeding grounds.

Vegetation

General Texts

63. Danserau, Pierre. 1957. *Biogeography.* New York, NY: Ronald Press Company. 384 pp. Library of Congress Catalog Card No. 57-6819. *(see 80)*

64. Daubenmire, Rexford. 1969. *Plant Communities: A Textbook of Plant Synecology.* New York, NY: Harper and Row. 300 pp. Library of Congress Catalog Card No. 68-11453.

This is a basic textbook of plant synecology, or the study of plant communities as components of ecosystems. The identification and inventory of vegetative communities presents many problems to the ecological planner, and this book will not solve all of these problems encountered. However, it does serve as an excellent introduction to the subject of vegetation and ecosystem classification, and also includes valuable chapters on the nature of plant communities, their analysis and descriptions, and on plant succession.

65. Eyre, S. R. 1963. *Vegetation and Soils: A World Picture.* Chicago, IL: Aldine Publishing Company. 342 pp. Library of Congress Catalog Card No. 63-18442.

This book deals primarily with the global distribution of vegetation and soils, focusing on interrelationships between the two phenomena, but vegetation communities are described, and vegetation maps of the continents have been included.

66. Hotchkiss, Neil. 1970. *Common Marsh Plants of the United States and Canada.* Washington, D.C.: U.S. Department of the Interior Fish and Wildlife Service. Resource Publication #93. 99 pp.

This text is designed to facilitate the identification of marsh plants without having to use technical botanical keys. Habitat, range and common form are listed for each species, and drawings of species are used for illustration.

Methods of Inventory and Analysis

67. Pfister, Robert D. 1976. "Land Capability Assessment by Habitat Types" from *Proceedings of the 1975 National Convention of the Society of American Foresters.* Ogden, UT: U.S. Department of Agriculture, Forest Service, pp. 312-325.

The author defines land capability as "the expression of all the environmental factors as they apply to biological potential of a given resource from a specific unit of land." This paper explores the possibilities of approaching this subject of land capability using habitat types, or potential vegetation.

Bibliographies

68. U.S. Department of the Interior. 1977. *Annotated Bibliography of Natural Resource Information.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service. *(see 12)*

Wildlife

General Texts

69. Committee on Agricultural Land Use and Wildlife Resources. 1970. *Land Use and Wildlife Resources.* Washington, D.C.: National Academy of Science. 200 pp. Library of Congress Catalog Card No. 70-607553.

    This is a good general text of wildlife and its relationship to land-use practices. The subject is approached through discussion of historical perspective, wildlife values, new patterns on land and water, influences of land management on wildlife, special problems of waters and watersheds, pesticides and wildlife, wildlife damage and control, and legislation and administration.

70. Flood, Bettina S., Mary Sangster, Rolin Sparrowe, Thomas S. Baskett. 1977. *A Handbook for Habitat Evaluation Procedures.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Resource Publication #132. 77 pp. Library of Congress Catalog Card No. 77-3326.

    This booklet outlines suggested habitat evaluation procedures for forest game, upland game, tree squirrels, terrestrial furbearers, aquatic furbearers, and waterfowl. The system is well outlined and easy to use, which makes this methodology particularly useful for planners and land resource specialists who are faced with the difficult task of evaluating wildlife resource areas in a given area in short periods of time.

71. Giles, Robert H. (ed.). 1971. *Wildlife Management Techniques* (Third Edition). Washington, D.C.: The Wildlife Society. 633 pp. Library of Congress Catalog Card No. 68-17250.

    This book is a collection of 24 chapters written by various individuals on topics of wildlife management. Chapters of particular interest to ecological planners are "Using the Literature on Wildlife Management: Reconnaissance Mapping and Map Use," "Habitat Analysis and Evaluation," and "Population Analysis."

72. Lyles, Charles H. Annual. *Fishery Statistics of the United States.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service.

    This is a good basic data source for fisheries data for the United States. The publication is illustrated with pictures of fish species, but consists primarily of tables.

73. Soil Conservation Society of America. 1973. *Wildlife and Water Management: Striking A Balance.* Ankeny, IA: Soil Conservation Society of America. 48 pp.

    This publication presents 8 papers which discuss various approaches to the problem of striking a balance between efficient water resource habitats.

74. U.S. Department of the Interior. Annual. *Federal Aid in Fish and Wildlife Restoration.* Washington, D.C.: Bureau of Sport Fisheries and Wildlife.

    This annual report of the Bureau of Sport Fisheries and Wildlife contains much valuable information on current federal efforts in sport fisheries and wildlife restoration, and contains statistical summaries of sport fisheries and wildlife data in the United States.

Bibliographies

75. Eschmeyer, Paul H. and Van T. Harris (eds.). 1974. *Bibliography of Research Publications of the U.S. Bureau of Sports Fisheries and Wildlife, 1928-72.* Washington, D.C.: U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Resource Publication #120. 154 pp.

    This bibliography lists the various research publications of the U.S. Bureau of Sport Fisheries and Wildlife, including topics which should be of interest to wildlife researchers, resource managers, and students.

76. U.S. Department of the Interior. 1977. *Annotated Bibliography of Natural Resource Information.* Washington, D.C.: Fish and Wildlife Service. *(see 12)*

Ecology

General Texts

77. Bailey, Robert G. 1978. *Descriptions of the Ecoregions of the United States.* Ogden, UT: U.S. Department of Agriculture, Forest Service. 77 pp. *(see 94)*

78. Bennett, Charles F. 1975. *Man and Earth's Ecosystem: On Introduction to the Geography of Human Modification of the Earth.* New York, NY: John Wiley and Sons, Inc. 331 pp. Library of Congress Catalog Card No. 75-22330.

    This is an introductory textbook which combines elements of geography, human ecology and ecology in an attempt to formulate a multidisciplinary view of the human impact on ecosystems.

79. Burke, John G. and Jill S. Reddig. 1976. *Guide to Ecology Information and Organizations.* New York, NY: The H. W. Whison Co. 292 pp. Library of Congress Catalog Card No. 75-45400.

    This publication lists citizenship guides, indexes, reference books, histories, monographs, government publications, nonprint media, periodicals, organizations, and government officials which relate to ecology and environment.

80. Danserau, Pierre. 1957. *Biogeography.* New York, NY: Ronald Press Company. 394 pp. Library of Congress Catalog Card No. 57-6819.

    This textbook deals primarily with a synthesis of the environmental relationships of living organisms. Major topics include the history of biota, bioclimatology, synecology, autecology, and human impact on the landscape.

81. Ehrenfield, David W. 1970. *Biological Conservation.* New York: Holt, Rinehart, and Winston, Inc. 276 pp. Library of Congress Catalog Card No. 76-107085.

This is a nice paperback on conservation of flora and fauna. Chapters on factors that threaten natural communities, endangered communities, factors that threaten species, preservation and case studies are included. As with soil conservation, biological conservation is an issue which ecological planners must deal with frequently. Introductory texts such as this one provide invaluable means for gaining a basic understanding of conservation issues and practices.

82. Odum, Eugene P. 1971. *Fundamentals of Ecology*. Philadelphia, PA: W. B. Saunders Co. 574 pp. Library of Congress Catalog Card No. 76-81826.

    A classic textbook of ecology, this book covers macroscopic or "big picture" ecology, habitat ecology and applications and technology in ecology, at the same time managing to be one of the more easily readible ecology texts. The sections covering applications and technology are particularly relevant to planning, but certainly the entire book provides valuable insight into the basic ecological principles.

83. Odum, Eugene P. 1975. *Ecology: The Link Between the Natural and the Social Sciences*. New York: Rinehart and Winston, Inc. Second edition. 224 pp. Library of Congress Catalog Card No. 63-13116.

    The fundamentals of ecology are presented in this classic paperback in a clearly written, easily comprehended style. The second edition is written with an increased perspective of the interdisciplinary aspects of ecology, and a valuable chapter on resources, pollution, bionomics and ecosystem management has been added.

84. Ricklefs, Robert E. 1973. *Ecology*. Newton, MA: Chiron Press. 861 pp. Library of Congress Catalog Card No. 72-97516.

    This is a basic well-written textbook of ecology, which covers the fundamentals of ecologic principles, with an emphasis on ecology as a natural science rather than on applications of ecology.

85. Watts, David. 1971. *Principles of Biogeography*. New York: McGraw-Hill Book Company. 402 pp. Library of Congress Catalog Card No. 70-156940.

    This is a general reference text on biogeography. As an interdisciplinary field, this topic is of general interest to ecologists and ecological planners. The chapter on people in ecosystems would probably be of greatest interest to planners, yet, on the whole this text is of limited direct value for planners.

86. Whittaker, Robert H. 1975. *Communities and Ecosystems*. New York, NY: MacMillen Publishing Co. 385 pp. Library of Congress Catalog Card No. 74-6636.

    This is a general ecology text which focuses on ecological concepts of communities, how they are composed of interacting species and how interacting communities comprise ecosystems. A well-written introduction to the subject, the book is primarily intended for introductory students at the college level.

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HUMAN ECOLOGY AND PLANNING

General Texts

87. Greenwood, Ned and J. M. B. Edwards. 1973. *Human Environments and Natural Systems: A Conflict of Dominion*. North Scituat, MA: Duxbury Press. 427 pp. Library of Congress Catalog Card No. 72-075107.

    This is a textbook of human ecology and environmental problems. Sections are included on land use, human population, ecology, food, materials, air and water pollution, land waste, urbanization, transportation, economic pressures, aesthetics, outdoor recreation, wilderness, population limitation, environmental control and strategies for change. An excellent introduction primer on problems in environmental science.

88. Herfindahl, Orris C. 1969. *Natural Resource Information for Economic Development*. Baltimore, MD: The Johns Hopkins Press. 212 pp. Library of Congress Catalog Card No. 69-15762.

    This book explores the topic of using natural resource information for economic development, with particular reference to Latin American needs and existing programs. Topics include applications of natural resource data for economic planning, decision analysis for determining natural resource data needs and balancing these needs against costs, and data gathering methodologies.

89. U.S. Department of Health, Education and Welfare. 1975. *State Life Tables: 1969 71* (2 Volumes). Washington, D.C.: U.S. Department of Health, Education and Welfare. DHEW Publication No. 75-1151.

    This publication provides standard life tables by state. This data is used as input to population models, and is usually a standard input to social assessment studies.

90. U.S. Department of Health, Education and Welfare. Annual. *Vital Statistics of the United States*. Washington, D.C.

    Vital Statistics is the standard source of natality, mortality and marriage-divorce data for regions and specific cities and towns in the United States. Such information is often used in planning studies, and this is probably the most commonly used source. The series is published in three volumes, Volume I—Natality, Volume II—Mortality, and Volume III—Marriage and Divorce.

Methods of Inventory and Analysis

91. Burkhardt, Dietrick F. and William H. Ittleson (eds.). 1978. *Environmental Assessment of Socioeconomic Systems*. New York, NY: Plenum Press. 587 pp. Library of Congress Catalog Card No. 77-235-28.

    This is a collection of papers presented at a conference on environmental assessment of socioeconomic systems, including topics of methodologies, and case studies in technology assessment, social systems assessment, and social impact assessment. The readings are valuable in that they point out the lack of adequate social impact assessment methodologies, and examine the current state-of-the-art approaches to this problem.

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92. Fitzsimmons, Stephen J., Lorrie I. Stuart and Peter C. Wolff. 1977. *Social Assessment Manual.* Boulder, CO: Westview Press, Inc. 289 pp. Library of Congress Catalog Card No. 76-58332.

This book serves as a manual for the compilation of the "Social Well-being Account," which is defined by the authors as "the product of an assessment of the comparative beneficial and adverse social effects likely to occur as a result of implementing or not implementing a particular development plan." The book concentrates on providing the information required as a social assessment for water development plans as mandated by guidelines established in 1973 by the Water Resources Council. As such, it provides planners with a valuable guiding source book for social assessments.

Bibliographies

93. Young, Gerald. 1978. *Human Ecology as an Interdisciplinary Domain: An Epistemological Bibliography.* Monticello, Illinois: Vance Bibliographies. 62 pp.

This well-researched bibliography gives an excellent overview of the pan-disciplinary nature of human ecology. Sections on applied human ecology include the topic areas of planning, landscape architecture, architecture, engineering, conservation and resource management, and public health and epidemiology.

METHODS OF RESOURCE INVENTORY AND ANALYSIS

94. Bailey, Robert G. 1978. *Descriptions of the Ecoregions of the United States.* Ogden, UT: U. S. Department of Agriculture, Forest Service. 77 pp.

This publication presents descriptions of "ecoregions" in the United States, and includes an ecoregion map and photo. Information on land surface form, climate, vegetation, soils and fauna is included with each ecoregion description. This information is of a highly generalized nature, yet it is frequently valuable to present a study site in such a broad regionalized context in order to gain an initial understanding of the environment. Thus the book is of some value to environmental planners as well as students.

95. Bartelli, Lindo. 1960. "General Soil Maps—A Study of Landscapes," *Journal of Soil and Water Conservation,* Vol. 21: 3-6. *(see 23)*

96. Cain, John M. and Marvin T. Beatty. 1968. "The Use of Soil Maps in the Delineation of Flood Plains," *Water Resource Research,* Vol. 4: 173-182. *(see 40)*

97. Chapin, F. Stuart, Jr., and Edward J. Kaiser. 1979. "Natural Environmental Inventory and Analysis," in *Urban Land Uuse Planning* (Third Edition). Champaign, IL: University of Illinois Press.

The recent third edition of this classic text includes a chapter on environmental inventory and analysis as used in ecological planning, and is significant in that it is perhaps the first appearance of this type of information in a traditional urban planning text. The chapter provides an excellent discussion of overlay and analysis techniques, and should be of interest to planners and planning students.

98. Clawson, Marion and Charles L. Stewart. 1965. *Land Use Information: A Critical Survey of U.S. Statistics Including Possibilities for Greater Uniformity.* Baltimore, MD: The Johns Hopkins University Press. 402 pp. Library of Congress Catalog Card No. 66-14380.

This book presents the results of a team study on the state of land-use information in the United States, and details the need for a unified data system. Chapters are included on concepts of land, land location and parcel identification, the role of land-use statistics, history of land-use information in the United States, classification schemes, and idealized system. Also included are valuable appendix sections on the Forest Service and SCS classification systems. This is a valuable aid to the planner who may be involved in the inventory of existing land-use, although some of the material may be somewhat dated, and many of the problems which are outlined in the book may have since been resolved, particularly with the advent of LANDSAT land-use mapping techniques.

99. Committee on Agricultural Land Use and Wildlife Resources. 1970. *Land Use and Wildlife Resources.* Washington, D.C.: National Academy of Sciences. 200 pp. Library of Congress Catalog Card No. 70-607553. *(see 69)*

100. Eastman Kodak Company. 1974. *Aerial Photography as a Planning Tool.* Rochester, NY: Eastman Kodak Company Publication No. M-128. 49 pp.

This publication is composed of seven papers which were presented in 1974 at a Kodak Seminar on "Aerial Photography as a Planning Tool." Topics discussed include legislative acts, data sources, information systems, and case studies.

101. Environment Canada. 1970. *The Canada Land Inventory.* Ottawa, Canada: Environment Canada.

The Canada Land Inventory serves as an excellent example of a centralized nationwide environmental inventory. Various publications and maps are available, including a guide for resource planning, an index of the inventory system and various 1:250,000 and 1:1,000,000 scale land capability maps.

102. Fabos, J. G. and S. J. Caswell. 1977. *Composite Landscape Assessment: Procedures for Special Resources, Hazards and Development Suitability: Part II of the Metropolitan Landscape Planning Model (METLAND).* Amherst, Massachusetts Agricultural Experiment Station, Research Bulletin 637. 323 pp.

This is an overview of the METLAND Composite Landscape assessment

study which was conducted at the University of Massachusetts. The assessment model is applied to spacial resource assessment, hazards assessment, development suitability, ecological stability, evaluation and implementation. The report presents valuable discussion of composite map construction and suitability models.

103. Ferris, K. H. and J. G. Fabos. 1974. *The Utility of Computers in Landscape Planning: The Selection and Application of a Computer Mapping and Assessment System for the Metropolitan Landscape Planning Model (METLAND)*. Amherst, MA: Massachusetts Agricultural Experiment Station. 116 pp. *(see 140)*

104. Flood, Bettina S., Mary Sangster, Rolin Sparrowe, Thomas S. Baskett. 1977. *A Handbook for Habitat Evaluation Procedures*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Resource Publication #132. 77 pp. Library of Congress Catalog No. 77-3326. *(see 70)*

105. Giles, Robert H. (ed.). 1971. *Wildlife Management Techniques* (Third Edition). Washington, D.C.: The Wildlife Society. 633 pp. Library of Congress Catalog Card No. 68-17250. *(see 71)*

106. Golet, Francis C. and Joseph S. Larson. 1974. *Classification of Freshwater Wetlands in the Glaciated Northwest*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service Resource Publication #116. 56 pp. *(see 60)*

107. Herfindahl, Orris C. 1969. *Natural Resource Information for Economic Development*. Baltimore, MD: The Johns Hopkins Press. 212 pp. Library of Congress Catalog Card No. 69-15762. *(see 88)*

108. Hill, David E. and Hugo F. Thomas. 1972. *Use of Natural Resource Data in Land and Water Planning*. New Haven, CT: The Connecticut Agricultural Experiment Station Bulletin 733. 47 pp.

    This report describes the basic natural resource inventory process as applied to land-use planning, centering on the use of geologic, soils and hydrologic data bases for use in the inventory. Problems of data integration to a common base and scale, construction of single-factor maps and overlay methods are discussed in detail. A case study undertaken in the Connecticut Valley is used for illustrative purposes.

109. Hilpman, Paul L. and Gary Steward. 1969. "Geology and Concern for the Environment," *Highway Research Record*, Vol. 271: 38-47. *(see 8)*

110. Klingebiel, A. A. and P. H. Montgomery. 1961. *Land-capability Classification*. Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service, Agriculture Handbook No. 210. 21 pp. *(see 28)*

111. Krutilla, John V. (ed.). 1972. *Natural Environments: Studies in Theoretical and Applied Analysis*. Baltimore, MD: The Johns Hopkins University Press. 352 pp. Library of Congress Catalog Card No. 72-4441.

    This is a volume of selected papers on natural environment management. Most of the papers are written on a highly technical and theoretical level, but papers on aesthetic landscape values, appraising landscape dimensions, and the effects of technological changes may be of some interest to ecological planners.

112. Leopold, Luna B. 1969. "Landscape Esthetics," *Natural History*, Vol. 78, No. 8: 36-45.

    This paper outlines a methodology which has been developed by the author for comparing the relative esthetic value of different landscapes. This is primarily a numerical approach which involves the computation of "uniqueess ratios" for different sites. The method is applied toward rating the relative esthetic value of Hell's Canyon (Idaho) as compared to a number of additional sites.

113. Litton, R. B., Jr., R. J. Tetlow, J. Sorenson and R. A. Beatty. 1974. *Water and Landscape: An Aesthetic Overview of the Role of Water in the Landscape*. Port Washington, NY: Water Information Center. 314 pp. Library of Congress Catalog Card No. 74-79147.

    This book presents a discussion on assessments of the aesthetic qualities of water-related landscapes. A classification framework, inventory techniques, and recommended policy adaptions are all discussed in some detail. In addition, several water landscape classification systems which have been used in the past are reviewed.

114. Lund, G. Hyde, Vernon J. LaBau, Peter F. Ffolliott and David Robinson (Technical Coordinators). 1978. *Integrated Inventories of Renewable Natural Resources: Proceedings of the Workshop*. Washington, D.C.: U.S. Department of Agriculture, Forest Service, General Technical Report RM-55. 482 pp.

    This is a large volume comprised of 82 articles in nine general topic headings. It is the result of a workshop held to promote the development of more efficient, standardized natural resource inventory methodologies. Topics included are information requirements, current techniques, the need for integrated inventory procedures, land classification systems, remote sensin, principles for integrating inventories, data processing, information systems, and state-of-the-art.

115. McAllister, Donald M. (ed.). 1973. *Environment: A New Focus for Land Use Planning*. Washington, D.C.: National Science Foundation. 328 pp. Library of Congress Catalog Card No. 73-600534. *(see 165)*

116. National Aeronautics and Space Administration. 1979. *Land Resource Inventory Demonstration Project*. Moffett Field, CA: Ames Research Center. 9 pp.

    This is a brief pamphlet which summarized the land inventory demonstration project in Idaho, Washington and Oregon. Examples of potential application of EROS photography of the states listed are included. Excellent color maps are included as an example of the types of maps which are produced by this project.

117. New York State Department of Environmental Conservation. 1975. *Natural Resource Inventory: A Guide to the Process*. Albany, NY: New York State Department of Environmental Conservation. 70 pp.

This report details the organization, mapping principles, information analysis, and data sources used in natural resource inventories, with specific reference to inventory efforts in New York State. The report is generally relevant to resource inventories in all regions and includes sections covering information analysis for geology, hydrology, soils, physical geography, land use, vegetation, wildlife and atmosphere.

118. Pessl, Fred, Jr., William H. Langer and Robert B. Ryder. 1972. *Geologic and Hydrologic Maps for Land Use Planning in the Connecticut River Valley*. Washington, D.C.: U.S. Geological Survey, Geological Survey Circular 674. 12 pp. *(see 9)*

119. Pfister, Robert D. 1976. "Land Capability Assessment by Habitat Types" from *Proceedings of the 1975 National Convention of the Society of American Foresters*. Ogden, UT: U.S. Department of Agriculture, Forest Service, pp. 312-325. *(see 67)*

120. Robinson, Arthur H. and Randall D. Sale. 1969. *Elements of Cartography*. New York: John Wiley and Sons, Inc. 415 pp. Library of Congress Catalog Card No. 69-19232.

A textbook of general elements of cartography, this book contains chapters on data compilation and generalization, data compilation from air photos, and cartographic design which would be of value to anyone involved in the process of making maps.

121. Selkregg, Lidia L., et al. 1974. *Alaska Regional Profiles*. (6 volumes: Southeast, Southcentral, Southwest, Arctic, Northwest, Yukon). Anchorage, Alaska: University of Alaska, Arctic Environmental Information and Data Center.

These are large scale inventories of the natural and human environments of Alaska, and serve as excellent examples of the biophysical inventory for planning applications. Inventory maps are large scale, due in part to available information, but nevertheless are excellent in format and presentation, and should be invaluable aids to regional planning efforts in the area. The Southeast and Southwest volumes are no longer available from the Arctic Environmental Information and Data Center, but may be in some libraries.

122. States, James B., Peter T. Haug, Thomas G. Shoemaker, Lanny W. Reed and Edward E. Reed. 1978. *A System Approach to Ecological Baseline Studies*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service. FWS/OBS-78/21. 392 pp. Library of Congress Catalog Card No. 78-600032.

This document constructs a holistic approach to the study of ecosystem components and functions, and presents techniques of ecosystem analysis and conceptual model-building. It is an extremely thorough, comprehensive treatise on the subject and is highly recommended as a useful guide for ecological baseline studies.

123. Steinitz, Carl, Timothy Murray, David Sinton, Douglas Way. 1970. *A Comparative Study of Resource Analysis Methods*. Cambridge, MA: Harvard University, Graduate School of Design. 382 pp.

This report presents a comparative discussion of sixteen resource analysis methodologies currently in use. Comparisons are illustrated with examples of maps, and matrices which compare various components of the analysis techniques.

124. Stewart, G. A. (ed.). 1968. *Land Evaluation*. Victoria, Australia: MacMillin of Australia. 392 pp.

This is a collection of symposium papers on land evaluation, which includes topics of principles of land classification and evaluation, land evaluation reviews and case studies, data handling and interpretation, land parameters, and senors for land parameters.

125. Swanson, Roger A. 1969. *The Land Use and Natural Resource Inventory of New York*. Albany, NY: New York State Office of Planning Coordination. 24 pp. *(see 142)*

126. U.S. Department of Agriculture. 1972. *Forest Landscape Management*. Washington, D.C.: Forest Service Northern Region. 137 pp.

Principles of landscape management are discussed in this book, including topics in the maintenance of visual resources during land management activities, definitions, elements of the visual resource, methodologies and applications to timber harvest, roads and structures.

127. U.S. Department of Agriculture. *National Forest Landscape Management*. (Series of publications). Washington, D.C.: Forest Service.

The *National Forest Landscape Management* series is a collection of reports which presents concepts of visual aspects of landscape management including dominance elements, dominance principles, and variable factors. Each chapter has been printed as a separate booklet, and the individual booklets discuss more specialized applications of the landscape management system.

128. U.S. Department of the Interior. 1968. *Where Not to Build: A Guide for Open Space Planning*. Washington, D.C.: Bureau of Land Management, Technical Bulletin No. 1. 160 pp.

This booklet presents a theory of open space, and discusses guidelines for open space planning in a case study region in Washington County, Utah. The presentation and methodology closely relates to ecological planning principles, and may be regarded as valuable supplementary ready for land-use planners interested in environmentally and esthetically sound approaches to open space planning.

129. U.S. Geological Survey. 1977. *Studying the Earth from Space*. Washington, D.C.: U.S. Department of the Interior. 24 pp.

This pamphlet provides a brief introduction of applications of space aerial photography in the fields of cartography, geology, geography, hydrology, and marine and land management.

130. Yanggen, D. A., M. T. Beatty and A. J. Brovald. 1966. "Use of Detailed

Soil Surveys for Zoning," *Journal of Soil and Water Conservation*, Vol. 21: 123-126. *(see 32)*

131. Zube, Ervin H. 1970. "Evaluating the Visual Cultural Landscape," *Journal of Soil and Water Conservation*, Vol. 25: 137-141.

This is a short article which outlines an approach to visual landscape assessment which was used in a large scale regional analysis of the northeastern United States. The method entails a subdivision of the landscape into landscape series and landscape units, and numerical ratings of the assigned units.

PROTOTYPICAL ENVIRONMENTAL STUDIES AND PLANS

132. Hills, G. A. and R. Portelance. 1960. *The Glackmeyer Report of Multiple Land-Use Planning*. Ontario: Ontario Department of Lands and Forests. 210 pp.

This report was a good early effort at applying land characteristics as a basis of land-use planning. The text explains not only the results of the ecological inventory and analysis, but also discusses the principles underlying this approach to planning. A very good selection on landform analysis is included; however, the discussion of soils is out of date.

133. Iowa Northland Regional Council of Governments. 1976. *County Living Study*. Waterloo, IA: Black Hawk County. 50 pp.

This report documents efforts in the areas of agricultural land preservation; the use of soil studies in the determination of residential development suitability, detailed cost analysis of rural residential development, and site design as applied to a county in Iowa. The report is illustrated with location site designs for potential "country living" development parcels. A few references are included.

134. Iowa Northland Regional Council of Governments. 1975. *A Natural Resource Inventory for Black Hawk County*. Waterloo, IA: Black Hawk Country. 30 pp.

This report documents a natural resource inventory study which was undertaken in Black Hawk County, Iowa, and includes summaries of drainage, geology, soils, vegetation, and wildlife. Discussion of the applicability of this data to land-use decision making is included. The report is illustrated with inventory maps, and 5 references are included. The primary value of this publication is that it does illustrate quite clearly the applicability of this kind of natural resource inventory to planning efforts.

135. Juneja, Narendra. 1974. *Medford*. Philadelphia, PA: Center for Ecological Planning and Design, University of Pennsylvania. 64 pp.

This is an ecological planning study of Medford Township, New Jersey. It was financed by the citizens of Medford in order to establish performance requirements for development. The report is generously illustrated with color maps, photographs, and drawings.

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136. The Town Forum. 1974. *The Cerro Gordo Experiment*. Cottage Grove, OR. 61 pp.

This book chronicles the application of ecological planning techniques towards the planning of a small experimental community in Oregon. While the development of composite maps is not particularly well treated and the graphic quality of inventory maps is not very high, the book still has value in showing how the planning method worked for this group of people.

137. Wallace, McHarg, Roberts and Todd. 1971-1974. *Woodlands New Community* (4 volumes). Philadelphia, PA: Wallace, McHarg, Roberts and Todd.

These reports cover a complete ecological inventory and analysis, an ecological plan, and guidelines for site planning. What makes the report valuable is that they were used for the successful planning of a new city. While these reports were intended primarily for use by the Woodlands Development Corporation; planners, landscape architects, architects, builders, financiers, scientists, educators and engineers should find them informative.

PLANNING INFORMATION SYSTEMS

138. Bie, Stein W. (ed.). 1975. *Soil Information Systems*. Wageningen, Netherlands: Centre for Agricultural Publishing and Documentation. 87 pp. *(see 25)*

139. Burger, Tom. 1977. "APSRS—An Automated System for Searching Aerial Photography" in *ACMS Bulletin*, (Feb.). Washington, D.C.: National Cartographic Information System: 7-9.

This paper documents the availability of aerial photographs through the NCIC, which has established a centralized computer cataloging system for aerial photography related to natural resource information.

140. Ferris, K. H. and J. G. Fabos. 1974. *The Utility of Computers in Landscape Planning: The Selection and Application of a Computer Mapping and Assessment System for the Metropolitan Landscape Planning Model (METLAND)*. Amherst, MA: Massachusetts Agricultural Experiment Station. 116 pp.

This publication provides an excellent discussion of this research group's efforts in the selection and application of computer techniques to landscape planning efforts. Sections on an introduction to the planning method, comparison of several of the available geographic information systems, selecting a map digitizing system, and comparison of various resource analysis techniques are included.

141. Mitchell, W. B., S. C. Guptill, K. E. Anderson, R. G. Fegeas, and C. A. Hallam. 1977. *GIRAS: A Geographic Information Retrieval and Analysis System for Handling Land Use and Land Cover Data*. Washington, D.C.: U.S. Geological Survey, Professional Paper 1059. 16 pp. Library of Congress Catalog Card No. 77-600047.

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This report describes the GIRAS geographic information system, covering such topics as general system description, data source maps, data volumes, data structures, data capture, retrieval manipulation, analysis and output, and current system design.

142. Swanson, Roger A. 1969. *The Land Use and Natural Resource Inventory of New York State.* Albany, NY: New York State Office of Planning Coordinator. 24 pp.

This book presents an excellent discussion of the methodology used in creating the LUNR resource information system in New York State. This computerized system utilizing aerial photographs, stereotypical interpretation, and computer data display, was one of the first of its nature to be implemented in the United States and serve as an excellent prototype for environmental data bases. Thus, the book should be required reading for planners and information specialists who are involved in the use of such data information systems.

143. Travis, Michael R. Gary H. Elsner, Way D. Iverson and Christine G. Johnson. 1975. *VIEWIT: Computation of Seen Areas, Slope and Aspect for Land Use Planning.* Berkeley, CA: U.S. Department of Agriculture. Forest Service General Technical Report PSW-11. 70 pp.

This report documents the VIEWIT computer program currently in use by the Forest Service, which has the capability of computing areas, slope and aspect for any area given a standard topographic map as input.

144. U.S. Department of the Interior. 1978. *Map Indexing System Users Manual.* Washington, D.C.: Fish and Wildlife Service, FWS/OBS-78/64. 23 pp. Library of Congress Catalog Card No. 78-60089.

MIS is the map indexing system component of the U.S. Fish and Wildlife Service Geographic Information System. It is a semi-automated system which contains data related to physical, biological, social, or economic factors which are of interest to the Fish and Wildlife Service. This pamphlet is a user's manual, geared towards providing the reader with background information on the system, outlining what information is available and instructing the user on how to assess this information.

EXISTING LAND-USE POLICIES

145. Bosselman, Fred, David Callies and John Banta. 1973. *The Taking Issue: An Analysis of the Constitutional Limits of Land Use Control.* Washington, D.C.: Council on Environmental Quality. 329 pp.

This publication presents an in-depth examination of the constitutional parameters within which land-use regulation must operate. As land-use regulation is implemented in the United States as a response to environmental problems, the "taking" issue—the issue of the constitutional legality of land-use regulation—is foreseen by the authors to become a key issue. This book takes a close look at the taking issue, cites many previous court decisions, persents an overview of current land-use problems, reviews the historical development of the taking issue, reviews current laws which relate to this issue, and discusses likely future trends in the legal interpretation. The book is thus intended for planners and specialists in environmental law who may well expect to encounter legal actions which question the constitutionality of land-use planning regulation.

146. Davis, Kenneth P. 1976. *Land Use.* New York, NY: McGraw Hill Book Co. 324 pp. Library of Congress Catalog Card No. 75-37593.

This is a small handbook on land use, which presents discussions on the topics of concepts of land, uses of land, land classification, land-use controls, planning processes, value measurement, decision-making processes and case studies. It serves as an excellent introductory text to the subject of land-use situations and problems.

147. Leedy, Daniel L., Robert M. Maestro and Thomas M. Franklin. 1978. *Planning for Wildlife in Cities and Suburbs.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service. 64 pp.

The primary focus of this publication is planning for wildlife preservation and conservation in the urban environment. Planning aspects, site design principles, and larger scale planning procedures are all covered. This material is of principal interest to site scale planners, but the principles of habitat and corridor preservation outlined in this text would be of equal value to regional planners.

148. Nieswand, G. H. and P. J. Pizor. 1977. *Current Planning Capacity: A Practical Carrying Capacity Approach to Land Use Planning.* New Brunswick, NJ: Cooperative Extension Service, Rutgers Extension Bulletin 413. 103 pp.

In this book the authors have defined Current Planning Capacity as "a measure of the ability of a region to accommodate growth and development within the limits defined by existing infrastructure and natural resource capabilities." This concept is developed in the report, which outlines a Current Planning Capacity Model, an implementation model, legal aspects, and relationships to the planning process.

149. Pennsylvania Department of Environmental Resource. 1977. *Introduction to Environmental Planning for Local Decision Makers.* Harrisburg, PA: Bureau of Environmental Planning. 60 pp.

This booklet is primarily intended to serve as an introductory guide to environmental planning for use by local planning officials. It covers general topics such as how to base environmental planning on predefined goals, what are existing state and federal land use and environmental requirements, and the general environmental planning process.

150. Stover, Emily Jane. 1975. *Protecting Nature's Estate: Techniques for Saving Land.* Washington, D.C.: Bureau of Outdoor Recreation. 123 pp.

This booklet outlines basic techniques of land preservation, including how to identify sensitive lands for preservation and political and social considerations. The publication makes use of ample photos and figures, contains a bibliography, and also includes appendices on environmental

conservation commissions and enabling legislations, land-use organizations and legislation/conservation restrictions.

ORGANIZATIONS AND AGENCIES

151. Dunn, James E., Jr. 1976. *Land Use Planning Directory of the 17 Western States.* Denver, CO: U.S. Department of the Interior, Bureau of Reclamation. 266 pp.

This is a listing of state planning offices, city and town planners, county, tribal and regional planners and councils of government in 17 western states including Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. As such, this publication should warrant the interest of planners and government officials.

152. Thibeau, Charles E. (ed.). 1972. *Directory of Environmental Information Sources.* Boston, MA: The National Foundation for Environmental Control, Inc. 457 pp. Library of Congress Catalog Card No. 78-158971.

This publication lists government agencies, citizens organizations, professional and occupational organizations, trade associations, education institutions, abstracts, and bibliographies which may serve as potential sources of environmental information. It is useful not only for locating specific information sources, but also for simply identifying environmentally related organizations in an area.

153. U.S. Department of Agriculture. 1975. *Forest Service Organizational Directory.* Washington, D.C.: Forest Service Publication FS-65. 146 pp.

Any persons who have actively sought out environmental information, particularly in the western states, have most likely turned to the U.S. Forest Service for natural resource information. This booklet outlines the existing Forest Service organizational heirarchy and lists addresses and principal employees for each Forest Service Branch operation. Included is a map of U.S. Forest Service jurisdictional districts.

154. U.S. Department of Commerce. 1976. *State and Local Environmental Libraries.* Washington, D.C.: U.S. Environmental Protection Agency and National Oceanic and Atmospheric Administration. 24 pp.

This book lists, by state, the addresses of state and local environmental libraries. Thus the publication should serve as an extremely useful guide to locating data sources for an ecological inventory.

155. U.S. Environmental Protection Agency. 1977. *Guide to EPA Libraries.* Washington, D.C.: Office of Planning and Management. 44 pp.

The Environmental Protection Agency operates on a nationwide scale 31 headquarters libraries, 10 regional offices, 4 environmental research centers, and various satellite laboratories and offices. These facilities, especially the libraries, are valuable depository sources of environmental information, particularly in the areas of the above mentioned facilities, and should be of interest to students, planners and researchers.

156. Velluci, M. J., N. D. Wright and G. P. Allen. 1974. *The National Directory of State Agencies, 1974-75.* Washington, D.C.: Information Resources Press. 601 pp. Library of Congress Catalog Card No. 74-18864.

This book presents an alphabetical listing of agency functions, a classified list of agency functions, state government telephone information numbers, state agencies by state, state agencies by function, and associations of state government officials. It is a valuable compilation of possible information sources which should be of interest to a wide range of individuals.

MISCELLANEOUS ECOLOGICAL PLANNING RESOURCES

General Texts

157. de Jouvenal, Bertrand, et al. 1968. *The Fitness of Man's Environment.* New York, NY: Harper and Row Publishers, Inc. 250 pp.

This paperback volume contains papers written by prominent scholars which deal with the general topic of people and their environment and specifically, human environment problems. The book contains no illustrations or references, and may be somewhat dated but still provide an interesting and highly readable introduction to the subject of people and their environment.

158. Flanagan, Dennis (ed.). 1970. *The Biosphere.* San Francisco: W. H. Freeman and Company. A Scientific American Book. 134 pp. Library of Congress Catalog Card No. 78-140849.

Reprinted from a special *Scientific American*, this useful book contains essays on the biosphere, the energy cycle of the earth, water cycles, important chemical and mineral cycles and human food, energy and materials production. Makes interesting reading for the non-scientist, is well-illustratad with photos and figures, and provides a broad understanding of the "living" environment.

159. Foin, Theodore C., Jr. 1976. *Ecological Systems and the Environment.* Boston, MA: Houghton Mifflin Co. 591 pp. Library of Congress Catalog Card No. 75-25010.

This is a well-written textbook of introductory concepts of environmental science. This book touches upon all of the critical areas of this emergent field, including ecological systems, environmental analysis, population, pollution, land use, conservation and recreation and thus serves as a good primer on these topics.

160. Hendler, Bruce. 1977. *Caring for the Land: Environmental Principles for Site Design and Review.* Chicago, IL: American Planning Association (formerly the American Society of Planning Officials). Report #328. 94 pp.

This book discusses the utilization of environmental principles in site scale planning processes. Topics of the overall planning process, special environmental considerations, site considerations, and design considera-

tions are included in this book, which can serve as a good source book for information on how to bring the use of environmental factors in planning down to the site scale.

161. Herner and Company. 1978. *EIS Cumulative 1977*. Washington, D.C.: Information Resources Press. 687 pp.

Environmental impact statements can be a valuable information source to planners since all impact statements contain environmental setting descriptions, and many list the information sources used. This index is the only currently available index of environmental impact statements. It is published monthly and annually, and is also available as a computer-searchable tape. Contents are arranged by topics such as land use, energy, and water. Annotations for each EIS listed include the purpose or issue, positive impacts, negative impacts, and alternatives considered.

162. Imhoff, E. A., T. O. Friz, and J. R. LaFevers. 1976. *A Guide to State Programs for the Reclamation of Surface Mined Areas*. Arlington, VA: U.S. Geological Survey, Circular 731. 33 pp. Library of Congress Catalog Card No. 76-600011.

This report provides a discussion of surface mining activities, non-federal government controls, and state reclamation programs, as well as providing a directory to state sources of information on surface mined area reclamation programs.

163. Keyes, Dale L. 1976. *Land Development and the National Environment: Estimating Impacts*. Washington, D.C.: The Urban Institute. 128 pp. Library of Congress Catalog Card No. 76-10104.

This book outlines approaches to comprehensive environmental impact assessment. Included are sections on air quality, water quality and quantity, wildlife and vegetation, noise, natural disasters and scarce resource preemption impacts.

164. Leopold, Aldo. 1949. *A Sand County Almanac*. New York, NY: Oxford University Press. Library of Congress Catalog Card No. 66-28871.

This classic work is a discussion of Leopold's land ethic. In his own words, "that land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics." This book has a wide appeal to naturalists, conservationists, scientists, planners and educators.

165. McAllister, Donald M. (ed.). 1973. *Environment: A New Focus for Land Use Planning*. Washington, D.C.: National Science Foundation. 328 pp. Library of Congress Catalog Card No. 73-600534.

This book presents the results of a RANN study undertaken to determine the research requirements of environmental planning and to identify new areas of knowledge which are needed. Good chapters are included on ecological concepts and applications to planning, environmental assessments, and data source.

166. McHarg, Ian L. 1969. *Design With Nature*. Garden City, NY: Double-

day/Natural History Press. 198 pp. Library of Congress Catalog Card No. 76-77344.

This is the classical commentary on ecological planning. *Design With Nature* is one of the most frequently cited and quoted books of the century. Released at the time of the first Earth Day, its impact has not even begun to be measured. The text is generously illustrated with maps, drawings and photographs. This book has a wide appeal to planners, landscape architects, scientists, naturalists, conservationists, educators and the general public.

167. Schaemen, Philip S. and Thomas Mueller. 1974. *Measuring Impacts of Land Development: An Initial Approach*. Washington, D.C.: The Urban Institute. 150 pp.

This book covers topics of the uses of environmental impact measures, data collection and presentation, and general issues for land use decision making.

168. Scheidegger, Adrian E. 1975. *Physical Aspects of Natural Catastrophes*. New York, NY: Elsevier Scientific Publishing Co. 289 pp. Library of Congress Catalog Card No. 74-10263.

This book deals with natural catastrophes, their causes, effects, predictability, risk, and preventive measures. Types of natural catastrophes are grouped into chapters on earthquakes, volcanic eruptions, slope-related catastrophes, snow and ice related catastrophes, water-related catastrophes, and climate-related catastrophes. Emphasis is placed on considertions for thae engineer, but the book is also highly relevant to the ecological planner whose tasks include the identification of potential environmental hazards in an area.

169. Schwartz, Charles F., Edward C. Thor and Gary H. Elsner. 1976. *Wildlife Planning Glossary*. Berkeley, CA: U.S. Department of Agriculture, Forest Service General Technical Report PSW-12. 252 pp.

This book contains more than 1400 terms and definitions which are applicable to fields of wildlife planning. The text includes lists of terms and lists of sources.

170. Soil Conservation Society of America. 1976. *Resource Conservation Glossary*. Ankeny, IA: Soil Conservation Society of America. 63 pp.

In this publication, definitions are provided for over 2700 terms which are commonly used in 18 disciplines, which include agronomy, biology, conservation, ecology, economics, engineering, forestry, fish and wildlife, geology, hydrology, mining, planning, pollution control, range science, recreation, soils, waste management, and water resources.

171. Soil Conservation Society of America. 1973. *Plants, Animals and Man*. Ankeny, IA: Soil Conservation Society of America. 272 pp.

———. 1975. *Land Use: Food and Living*. Ankeny, IA: Soil Conservation Society of America. 236 pp.

These are both large collections of papers presented at annual meetings of the Soil Conservation Society of America, assembled under topic head-

ings such as air resources, land-use planning, water resources, soil resources, waste management, resource conservation, environmental education, outdoor recreation, vegetation and erosion and sedimentation.

172. The Citizen Advisory Committee on Environmental Quality. 1970. *Community Action for Environmental Quality.* Washington, D.C.: Citizens Advisory Committee on Environmental Quality. 42 pp.

This booklet outlines strategies for community action towards improving environmental quality. It details a process which entails initial approaches to agencies which might provide helpful services, open space and recrational development strategies, townscape and landscape improvements, clean air and water strategies, and implementation of environmental education programs.

173. U.S. Department of the Interior. Annual. *Public Land Statistics.* Washington, D.C.: Bureau of Land Management.

This is a valuable data source of information on the public lands of the United States, and BLM program operations which include land disposition and use, forest management, outdoor recreation and wildlife, range management, resource conservation and development, minerals, classification and investigation, and public land surveys. The publication is comprised mostly of data tables, and should be of interest to planners and land-resource specialists, especially in the western United States.

174. U.S. Environmental Protection Agency. 1977. *The Public Benefits of Cleaned Water: Emerging Greenway Opportunities.* Washington, D.C.: Office of Land Use Coordination. 31 pp.

This booklet documents the 208, 210, and 402 water legislation, and discusses how they have opened up opportunities for water front improvements with potential for public and private use. Included are lists of EPA and BOR (Bureau of Outdoor Recreation) regional offices, and design guidelines for greenway developments.

Bibliographies

175. Council of Planning Librarians. 1958-1978. *CPL Exchange Bibliographies.* Monticello, IL: Council of Planning Librarians.

The Council of Planning Librarians published a comprehensive series of bibliographies of general and current interest in the years 1958-1978. In July of 1978 the series was discontinued, and the CPL offices moved to 1313 E. 60th Street, Merriam Center, Chicago, IL, 60637. The CPL Exchange Bibliographies are an invaluable source of information for planners, and have been replaced in January 1979 with a new series entitled CPL Bibliographies.

176. Ralston, Sally, David Hilbert, David Swift, Barbara Carlson and Leta Merties. 1977. *The Ecological Effects of Coal Strip Mining: A Bibliography with Abstracts.* Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, FES/OBS-77/09. 416 pp. Library of Congress Catalog Card No. 77-81611.

This bibliography lists references which relate to the ecological effects of coal strip mining, including such topics as the effects of strip mining on climate and topography, soils, aquatic components, plants, animals, general reclamation, human components, methods of reclamation, computer models, and bibliographies.

177. U.S. Department of Agriculture. 1978. *List of Available Publications of the USDA.* Washington, D.C.: Publications Division, Office of Government and Public Affairs. 130 pp.

This is a list of publications of the USDA, arranged by subject. Citations are listed by topic, and relevant topics include conservation, rural development and soil science. A useful aid for locating recent environmental publications.

178. U.S. Department of the Interior. 1978. *Bibliography of Manuals and Handbooks from Natural Resource Agencies.* Washington, D.C.: Fish and Wildlife Service, FWS/OBS-78/22. 79 pp. Library of Congress Catalog Card No. 77-01430.

This booklet lists manuals and handbooks used in federal and state natural resource agencies in the 17 western states. This kind of resource is frequently the most up-to-date existing information on environmental field methods, classification systems, and other methodologies currently in use by various resource agencies, and thus are often more valuable information sources than textbooks.

179. U.S. Environmental Protection Agency. Quarterly publication. *EPA Publications Bibliography.* Washington, D.C.: Office of Planning and Management.

A bibliography of EPA publications, this publication is cross-referenced and includes instructions for ordering publications. Listings cover a broad range of environmental topics, and thus this resource would be of interest to students, researchers, and professionals in the environmental field.

180. Vance, Mary (ed.). 1978-present. *Vance Bibliographies.* Monticello, IL: Vance Bibliographies.

The Vance Bibliographies are a series of planning related bibliographies which were started in 1978 as an offshoot of the old CPL Exchange Bibliographies Series. These bibliographies are of general interest to planners.

FARMLANDS PRESERVATION RESOURCES

The Issue of Farmlands Preservation

181. Beldon, Joe, Gibby Edwards, Cynthia Guyer and Lee Webb (eds.). No date. *New Directions in Farm, Land and Food Policies: A Time for Local and State Action.* Washington, D.C.: Conference on Alternative State and Local Policies. 319 pp.

This publication presents a progressive agenda on farm, land and food

policies for state and local action. Each of the seventeen chapters includes a narrative outlining innovative approaches and policy alternatives that have been proposed and/or implemented in states, counties and cities. Following each of the narratives are several articles and reprints which describe the most exciting of these new proposals.

182. Blobaum, Roger. 1974. *The Loss of Agricultural Land.* Washington, D.C.: Citizen's Advisory Committee on Environmental Quality. 30 pp.

This report looks at the issue of agricultural preservation and the increasing amount of land taken out of production. The major topic areas reviewed are a national inventory of soil and water conservation needs, the amount of land being planned for development through conversion of productive farmland to urban uses, the recreation home land boom, energy-related land demands, the economic impact of conversion, and planning techniques.

183. Cotner, M. L., M. D. Skold and O. Krause. 1975. *Farmland: Will There Be Enough?* Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, Natural Resource Division, ERS-584. (May). 15 pp.

This illustrated report presents 1974 statistics regarding cropland production, the amount of land added to and lost from agricultural production, the amount of land in SCS capability classes I-III, and outlook for future land conversion.

184. Diderikson, Raymond I., Allen R. Hidlebough and Keith O. Schmude. 1977. *Potential Cropland Study.* Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service, Statistical Bulletin No. 578 (October). 104 pp.

This report is a result of an extensive survey concerning the amount of land available for conversion to agriculture. Also discussed in this report are the general reasons why some land cannot be converted. These reasons include climate, slope, the size of parcels and other physical and socioeconomic reasons.

185. Fletcher, W. Wendell. 1978. *Agricultural Land Retention: An Analysis of the Issue. A Survey of Recent State and Local Farmland Retention Programs and a Discussion of Proposed Federal Legislation.* Washington, D.S.: Congressional Research Service, Library of Congress, 78-177 ENR (August 31). 52 pp.

This excellent brief synopsis of the agricultural land issue covers recent state and local farmland retention programs and a discussion of proposed federal legislation.

186. Fletcher, W. Wendell and Adrienne G. Grenfell. 1978. *Preservation of Agricultural Land—An Annotated Bibliography.* Washington, D.C.: Congressional Research Service, Library of Congress, 78-238 ENR (November 28). 55 pp.

This annotated bibliography includes such topic areas as nationwide estimates of present and future trends, the conversion of farmland to urban use, the conversion of farmland to non-urban use, limiting factors affecting agricultural production and land needs, and state and local programs and studies.

187. Frey, H. Thomas and Robert L. Otte. 1975. *Cropland for Today and Tomorrow.* Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, National Resource Division, Agricultural Economic Report No. 291 (July). 17 pp.

This illustrated report presents data on the nation's actual and potential cropland resources. The present cropland base is examined mainly in terms of cropland uses in 1973-74 compared with 1969. Potential cropland is examined in terms of the characteristics and distribution of land physically suitable for crop use but now in non-cropland uses, primarily pasture and forestry.

188. Gray, William H. 1975. *Agricultural Land Use in Washington: Conversion or Preservation.* Pullman, WA: Washington State University Extension Circular, EM 3935 (April). 6 pp.

This short paper discusses the importance of prime agricultural lands in the state of Washington as contributing to the state's economy through employment and product sales, while being aesthetically and psychologically beneficial. Prime agricultural lands are more productive, requiring less cost to farm than marginal lands, and once converted from agricultural use, become practically impossible to reconvert to farm use.

189. Isberg, Gunnar. 1973. "Controlling Growth on the Urban Fringe," *Journal of Soil and Water Conservation*, Vol. 28, No. 4 (July/August): 155-161.

This article discusses the problem of urban expansion into areas of agricultural or environmental importance. Patterns of urban growth are presented with several methods of controlling development. These methods include utility extension policies, large-lot or agricultural zoning, parks and open space policies, and improving communications between urban and regional planners and agriculturalists.

190. Lee, Linda K. 1978. *A Perspective on Cropland Availability.* Washington, D.C.: U.S. Department of Agriculture, Economics, Statistics and Cooperatives Service, Agricultural Economic Report No. 406 (July). 23 pp.

This illustrated study analyzes the amount, location, and quality of land withcropland potential by region. Declines in the cropland base through irreversible land use changes as well as the issue of prime farmland are investigated. In addition, future research needs are outlined.

191. Little, Charles E. (ed.). 1979. *Land & Food, The Preservation of U.S. Farmland.* Washington, D.C.: American Land Forum (Report number 1). 64 pp.

This well-written, illustrated report provides an excellent overview of the farmland preservation issue. Important sources and resources are included.

192. National Trust for Historic Preservation. 1979. *Rural Conservation.* Washington, D.C.: Information Sheet No. 19. 28 pp.

This report discusses the importance of relating conservation and preser-

vation efforts. An annotated bibliography and a list of resources is included.

193. Soil Conservation Society of America. 1976. *Retention of Agricultural Land* (series of articles). Ankeny, IA: Special Publication No. 19. 30 pp.
This collected series of articles includes the topic areas of the overall issue of agricultural land retention, state and local programs, and planning methods for preservation.

194. Toner, William. 1978. *Saving Farms and Farmlands: A Community Guide*. Chicago, IL: American Planning Association (formerly the American Society of Planning Officials). Report No. 333. 45 pp.
This down-to-earth report reviews both the purpose of saving farmlands and how to approach solving the problem of agricultural land conversion. Illustrated with photographs and graphics, the case studies reviewed include Walworth County, Wisconsin; Columbia County, Wisconsin; Black Hawk County, Iowa; and Tulare County, California.

195. U.S. Department of Agriculture Committee on Land Use. 1975. *Perspectives on Prime Land* (background papers for the seminar on Retention of Prime Lands). Washington, D.C.: Soil Conservation Service, Information Division (July). 257 pp.
These are the background papers from the Department of Agriculture's 1975 two-day seminar on the retention of prime lands. The topics covered by these papers include land-use trends, competing uses with agriculture, future agricultural land requirements, future forestry land needs, prime and unique lands criteria, the political and economic aspects of agricultural land retention and the relationship of the states to the issue.

196. U.S. Department of Agriculture Committee on Land Use. 1975. *Recommendations on Prime Land* (from the seminar on Retention of Prime Lands). Washington, D.C.: Soil Conservation Service, Information Divition (July). 54 pp.
This is the summary report from the Deparment of Agriculture's 1975 two-day seminar on the retention of prime lands. The summary includes findings, conclusions and recommendations reached by the seminar participants.

197. Urban Land Institute. 1975. "Agricultural Retention: An Emerging Issue" (a series of articles) *Environmental Comment*. Washington, D.C.: Research Division, publication #21 (May). 16 pp.
This issue of *Environmental Comment* is devoted to the issue of farmland retention. Topics of the articles include the overall issue of agricultural land preservation, use-value farmland assessments, legal aspects, and alternatives for rural development.

198. Yannaconne, Victor John, Jr. 1975. "Agricultural Lands, Fertile Soils, Popular Sovereignty, the Trust Doctrine, Environmental Impact Assessment and the Natural Law," *North Dakota Law Review*, Vol. 51: 615-653.
This important article discusses the legal aspects of agricultural land preservation, with special attention paid to constitutional law.

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Federal Programs

199. Beldon, Joe, Gibby Edwards, Cynthia Guyer and Lee Webb (eds.). No date. *New Directions in Farm Land and Food Policies: A Time for Local and State Action*. Washington, D.C.: Conference on Alternative State and Local Policies. 319 pp. *(see 181)*

200. Fletcher, W. Wendell. 1978. *Agricultural Land Retention: An Analysis of the Issue. A Survey of Recent State and Local Farmland Retention Programs and a Discussion of Proposed Federal Legislation*. Washington, D.C.: Congressional Research Service, Library of Congress, 78-117 ENR (August 31). 52 pp. *(see 185)*

201. Fletcher, W. Wendell and Adrienne G. Grenfell. 1978. *Preservation of Agricultural Land—An Annotated Bibliography*. Washington, D.C.: Congressional Research Service, Library of Congress, 78-238 ENR (November 28). 55 pp. *(see 186)*

202. Jeffords, James M. 1979. "Protecting Farmland: Minimizing the Federal Role," *Journal of Soil and Water Conservation*, Vol. 34, No. 4. (July/August): 158-159.
This is an important statement about federal farmland protection legislation by the Vermont congressman who has been the leader in the field.

203. Johnson, William M. No date. *Classification and Mapping of Prime and Unique Farmlands*. Washington, D.C.: U.S. Department of Agriculture, Soil Conservation Service: 10 pp.
This publication explains the SCS system for the identification of prime and unique lands.

204. Mitchell, Robert L. 1979. *Agricultural Land Preservation* (Policy Statement of the Farmers Home Administration in Michigan). East Lansing, MI: U.S. Department of Agriculture, Farmers Home Administration (January 30). 3 pp.
This policy statement from the Michigan Farmers Home Administration is a response to a policy directive from the secretary of USDA which instructed administrators to evaluate the impact of their programs on farmland. Through its housing loans, the Farmers Home Administration has had a significant impact on farmland. Since the Farmers Home Administration is regulated through the individual states, each has to take separate action. Michigan was the first state to do so.

205. U.S. Congress. 1978. "Agricultural Land Retention Act," *Congressional Record*, Vol. 124, No. 23 (February 23).
The Agricultural Land Retention Act was proposed by Vermont Representative James Jeffords in the 95th Congress. Though the measure did not pass then, a similar bill was introduced by Representative Jeffords in the 96th Congress. The Act proposed a formation of an Agricultural Land Review Commission and the establishment of demonstration programs.

206. U.S. Congress. 1979. "Farmland Protection Act," *Congressional Record*. Vol. 125, No. 38 (March 27).

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The Farmland Protection Act was proposed by Washington Senator Warren Magnuson in the 96th Congress. The Act proposed a national farmland policy and research and technical assistance programs.

207. U.S. Department of Agriculture. 1978. *Statement on Land Use Policy.* (Secretary's memorandum No. 1827, revised). Washington, D.C. (October 30). 5 pp.

The purpose of this policy was to coordinate USDA programs as they affect the preservation of agricultural land.

208. U.S. Environmental Protection Agency. 1978. *EPA Policy to Protect Environmentally Significant Agricultural Land* (memorandum and related appendix from Administrator Douglas Costle). Washington, D.C. (September 8). 37 pp.

The purpose of this policy was "to establish EPA policy that will recognize the food production and environmental value of agricultural land and the necessity to protect them." This policy is anticipated to affect EPA's construction grant program for municipal sewage treatment works, which has been criticized by many for contributing to urban sprawl.

State and Provincial Programs

209. Barrows, Richard. 1978. *Wisconsin's Farmland Preservation Program.* Madison: University of Wisconsin Extension circular (May, G2890). 4 pp.

This concise circular provides an excellent explanation of Wisconsin's Farmland Preservation Program by its first administrator. Planning standards are explained for both the first and second phases of the program. Wisconsin's program seeks to stimulate local initiative and to combine tax incentives with local planning and zoning and with conservation practices.

210. Beldon, Joe, Gibby Edwards, Cynthia Guyer and Lee Webb (eds.). No date. *New Directions in Farm, Land and Food Policies: A Time for Local and State Action.* Washington, D.C.: Conference on Alternative State and Local Policies. 319 pp. *(see 181)*

211. Conklin, Howard E. and William R. Bryant. 1974. *Agricultural Districts: A Compromise Approach to Agricultural Preservation.* Ithaca, NY: Cornell University, Department of Agricultural Economics. No. 74-22 (September). 7 pp.

This paper reviews briefly the rural land-use situation in the state of New York, and then discusses the state Agricultural District Law. New York's Agricultural District Law contains a series of interrelated provisions designed to encourage the continuance of agriculture under conditions of urban sprawl and its associated problems. Other states with similar rural land-use problems may find this approach helpful.

212. Fletcher, W. Wendell. 1978. *Agricultural Land Retention: An Analysis of the Issue. A Survey of Recent State and Local Farmland Retention Programs and a Discussion of Proposed Federal Legislation.* Washington, D.C.: Congressional Research Service, Library of Congress, 78-177 ENR (August 31). 52 pp. *(see 185)*

213. Fletcher, W. Wendell and Adrienne G. Grenfell. 1978. *Preservation of Agricultural Land—An Annotated Bibliography.* Washington, D.C.: Congressional Research Service, Library of Congress, 78-238 ENR (November 28). 55 pp. *(see 186)*

214. Gray, William. 1975. *Agricultural Land Use in Washington: Conversion or Preservation.* Pullman, WA: Washington State University Extension Circular EM 3935 (April). 6 pp. *(see 188)*

215. Government of Ontario. 1978. *Food Land Guidelines: A Policy Statement of the Government of Ontario on Planning for Agriculture.* Toronto: Ontario Ministry of Agriculture and Food, Food Land Development Branch. 28 pp.

This statement explains Ontario's agricultural planning policy, the methods used for identifying agricultural resource lands, and implementation guidelines for achieving the policy. Ontario's policy should be interesting to those approaching agricultural preservation on the state level.

216. Hunt, Margot and Carol Smith. 1977. "Deciding the Future of Pennsylvania's Farmland," *Facts and Issues.* League of Women Voters of Pennsylvania, #P628. 6 pp.

This short article contains a very extensive review of two agricultural preservation laws used in Pennsylvania: Act 515 of 1966 and Act 319 of 1974. Differential assessment, the assessment of the value of land in its current use rather than its market value, is discussed as the major emphasis of both these Acts. The effectiveness of these Acts in preserving farmland and open space as seen through public participation in the programs is evaluated. Though written for Pennsylvania citizens, others may find this article helpful.

217. Johnson, James A. and Pamela G. Wiley. No date. *Participation in the Wisconsin Farmland Preservation Program: December 1, 1977 to December 31, 1978.* Madison: Department of Agriculture, Trade and Consumer Protection, Farmland Preservation Program Technical Report No. 3. 12 pp.

This report provides a brief explanation of Wisconsin program for retaining its agricultural lands and its success during its first year. A comparison is made with other states attempting to preserve farmlands through tax credits.

218. Land Conservation and Development Commission. 1977. *Oregon's Agricultural Land Protection Program.* Salem, OR: Department of Land Conservation and Development (October 24). 3 pp.

This is a brief explanation of Oregon's land-use policy of 1973 and its older Greenbelt Law of 1961 and how each relate to the protection of farmland. Like Wisconsin, Oregon links its tax policies to local compre-

hensive planning and zoning. Oregon goes one step further and requires all local governments to comply with statewide goals. For agricultural preservation, Oregon specifies that lands with high SCS soil capability ratings be placed in exclusive farm use zones.

219. Land Conservation and Development Commission. No date. *Common Questions About Statewide Goal #3, Agricultural Lands,* Salem, OR: Department of Land Conservation and Development. 9 pp.

This paper lists the common questions received by the LCDC and the answers given relating to Oregon's statewide goal #3 which addresses agricultural land.

220. Land Conservation and Development Commission. No date. *Statewide Planning Goals and Guidelines.* Salem, OR: Department of Land Conservation and Development. 24 pp.

This newsprint circular clearly explains all of Oregon's 19 statewide planning goals and guidelines, including goal #3, Agricultural Lands, and goal #14, which deals with the establishment of urban growth boundaries.

221. Mitchell, Robert L. 1979. *Agricultural Land Preservation* (Policy Statement of the Farmers Home Administration in Michigan). East Lansing, MI: U.S. Department of Agriculture, Farmers Home Administration (January 30). 3 pp. *(see 204)*

222. Office of State Planning and Development. 1978. *A Land Policy Program for Pennsylvania. A Final Policy Report: Part C. Rural/Farm Strategy.* Harrisburg, PA: Commonwealth of Pennsylvania. 22 pp.

This report discusses the topic of agricultural preservation as it relates to Pennsylvania. First, the role of agriculture in Pennsylvania is presented with an explanation of why to preserve agricultural land. Several different methods are then reviewed including differential assessments, purchase and lease-back, purchase of development rights, transfer of development rights, agricultural districts and capital gains tax. The final part of the report is devoted to the formation of agricultural districts.

223. Soil Conservation Society of America. 1976. *Retention of Agricultural Land* (series of articles). Ankeny, IA: Special Publication No. 19. 30 pp. *(see 193)*

Local Programs

224. Agricultural Preservation Task Force. 1979. *A Deed Restriction Program to Preserve Farmland in Lancaster County, Pennsylvania.* Lancaster, PA: Lancaster County Planning Commission. 3 pp.

This report is the recommendation of Lancaster County's Agricultural Preservation Task Force for retaining county agricultural land. The report describes a deed restriction program as a method for retaining productive agricultural land. Developed as a report for the Lancaster County Board of Commissioners, this document may be available from the Lancaster County Planning Commission.

225. Bare, Bruce B., Lloyd Skinner, K. P. Rustagi and Gerald Schreuder. 1978. *A Citizen's Guide to Using the Input-Output Multipliers.* Seattle: University of Washington, College of Forestry Resources. 19 pp.

Prepared for the Chelan County Planning Department, this report is a study of the economic impacts of alternative agricultural land-use plans for the county. The report describes the three types of multipliers and uses a demonstration of multipliers to help analyze the impact of the permanent loss of orchard acreage on the county's economy.

226. Beldon, Joe, Gibby Edward, Cynthia Guyer and Lee Webb (eds.). No date. *New Directions in Farm, Land and Food Policies: A Time for State and Local Action.* Washington, D.C.: Agricultural Project, Conference on Alternative State and Local Policies. 319 pp. *(see 181)*

227. Berks County Planning Commission. 1978. *Berks County Agricultural Land Preservation Program.* Reading, PA: 45 pp.

This report summarizes the extent of rural development and agricultural activity in Berks County and presents recommendations to be used as a basis for establishing an agricultural preservation strategy. Methods reviewed for preserving agriculture in the country are zoning, crop productivity ratings, soil classification, agricultural districts, taxation policies, and both transfer and purchase of development rights.

228. Bureau of Environmental Planning. 1978. *Exploring the Use of TDR in Pensylvania: Conference Proceedings.* Harrisburg, PA: Department of Environmental Resources. Environmental Planning Information Series Report No. 2. 102 pp.

This report was developed as a result of a southeastern Pennsylvania conference among several state and local planning agencies and commissions where the Transferable Development Rights (TDR) concept was discussed. Three case studies of the use of Transfer of Development Rights in Chester County, Pennsylvania, are included.

229. Chelan County Planning Department. 1978. *The Agricultural Policy Program: A Citizen-Development Proposal.* Wenatchee, WA. 21 pp.

This report provides an explanation of the Chelan County Agricultural Policy Program developed through a very extensive citizen participation program. The highlights of the program are the agricultural-irrigated zones which define those areas to be retained for farmland and the establishment of Local Review Boards throughout the county in order to encourage local community involvement in reviewing agricultural land use decisions. The report is in the form of several leaflets with illustrated maps of the five proposed A-I Zones.

230. Chelan County Planning Department. 1977. *Background Papers for Agricultural Land Use Study in Chelan County.* Wenatchee, WA. 36 pp.

This report provides the basic research for supporting the issue of agricultural land retention in Chelan County, Washington. Topics include the economic aspects of agriculture in the county, orchard acreage and fruit production levels and trends, residential expansion in the county and its related costs to the farmers.

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231. Chester County Board of Commissioners. 1979. *The Role of Agriculture in Chester County.* West Chester, PA. 36 pp.

This report represents an attempt to characterize the agricultural industry in Chester County, and to determine its value as a social, aesthetic, and economic resource. It presents numerous findings and statistics relevant to a wide range of agricultural concerns. It is a working paper and is intended to serve as an easy guide for other areas or agencies to make an assessment of the role of agriculture in their communities.

232. Citizens' Study Committee. 1979. *Saving Farmlands and Open Space.* Seattle: King County Office of Agriculture. 22 pp.

This study was conducted by the Farmlands Citizens' Study Committee of King County, Washington. The report includes an examination of available alternatives and a presentation of the best means of preserving farmlands and related open space. The committee proposed a county-wide bond issue for the acquisition of voluntarily offered development rights. The report contains charts, photos and several maps including potential land eligible for acquisition in King County.

233. Clark, Janice M. No date. *Agricultural Zoning in Black Hawk County, Iowa.* Waterloo, IA: Black Hawk County, Zoning Administrator. 12 pp.

This report concerns the issue of agricultural land loss through the development of residential areas caused by liberal zoning ordinances. The author suggests a set of criteria whereby rural residential growth would take place in a more directed manner. Black Hawk County employs its own Corn Suitability Rating (CSR) as a method for determining productive and nonproductive farmlands.

234. Conklin, Howard E. 1967. *Property Tax Incentives to Preserve Farming in Areas of Urban Pressure.* Ithaca, NY: Cornell University Agricultural Experiments Station. Department of Agricultural Economics, No. 76-2. 7 pp.

This paper discusses the issue of agricultural land retention along the urban fringe with case studies of two counties in the state of New York: Orange County (a semi-rural area), and Suffolk County (a semi-suburban area). Land retention methods of agricultural districts with farm-value assessments and property tax incentives are discussed as present attempts to preserve the agricultural livelihood of these two counties.

235. Fletcher, W. Wendell. 1978. *Agricultural Land Retention: An Analysis of the Issue, A Survey of Recent State and Local Farmland Retention Programs, and a Discussion of Proposed Federal Legislation.* Washington, D.C.: Congressional Research Service, Library of Congress, 78-177 ENR (August 31). 52 pp. *(see 185)*

236. Gale, Dennis E. and Harvey Yampolsky. 1975. "Agri-Zoning—How They Gonna Keep'em Down on the Farm," *Planning* (October).

This short article reviews the Suffolk County issue of decreasing agricultural land due to farmers selling to developers. The article also reviews the methods used in the county to combat this problem. Discussed briefly as methods for retaining agricultural land, are preferential tax schemes and the transfer of development rights.

237. Heer, Philip E. and Associates. 1972. *Performance Zoning II* (revised). Greenfield, MA: Franklin County Commissioners. 49 pp.

This working paper discusses the general approach to performance zoning including a model zoning by-law for Franklin County, Massachusetts. The method of performance zoning was developed for the county in 1971, but further experimentation was needed before the county could adopt a Performance Zoning By-Law.

238. Iowa Northland Regional Council of Governments. 1975. *County Living Study.* Waterloo, IA: Black Hawk County. 50 pp. *(see 133)*

239. Iowa Northland Regional Council of Governments. *A Natural Resource Inventory for Black Hawk County.* Waterloo, IA: Black Hawk County. 30 pp. *(see 134)*

240. Jones, Leroy A. 1974. *Regional Agriculture Land Use Ttechnical Study: Central Puget Sound Region.* Seattle: Puget Sound Government Conference.

This regional conference report provides information on the agricultural industry of the area as it was in 1974, important trends of recent years and developing problems facing the agricultural industry. The report attempts to address these problems by assessing the costs and benefits to the region.

241. Office of Agriculture. 1976. *King County Agricultural Land Retention Program.* Seattle: King County, Division of Planning. 14 pp.

This report is a brief review of King County's Agricultural Land Preservation program, including a discussion of the failure of past efforts (zoning, tax easements and policy statements) to preserve agricultural land and a presentation of a proposed development rights program.

242. Office of Agriculture. 1977. *Proposed Agricultural Land Preservation Program.* Seattle King County, Division of Planning. 50 pp.

This report analyses and evaluates alternative land program methods and presents implementation proposals for a possible agricultural land preservation program for King County. Included in the report are the attitudes and opinions of the five District Advisory Committees whose districts include lands identified for study, and answers to questions directed to a group of national and Canadian agricultural land preservation program directors.

243. Office of Agriculture. 1978. *Draft Environmental Impact Statement; King County Agricultural Rentention Program.* Seattle: King County, Division of Planning. 95 pp.

Satisfying the requirement as mandated to federal, state and local agencies, this draft EIS was prepared to assess the impact of the proposed King County Agriculture Land Retention Program on the economic, social and physical environments of the county.

244. Klein, John V. N. 1974. *Report of the Suffolk County Agricultural Advisory Committee to the Suffolk County Legislature.* Hauppauge, NY: Farmlands Preservation Program. 8 pp.

This report of the Suffolk County Agricultural Advisory Committee discuss the county executive's proposal for the preservation of farmlands through the purchase of title and development rights, including considerations and specific recommendations for implementation of the program.

245. Klein, John V. N. 1973. *Farmlands Preservation Programs, Report to the Suffolk County Legislature.* Hauppague, NY: Farmlands Preservation Program. 28 pp.

This report presents a significantly more detailed look at Suffolk County, New York, including a discussion of the physical setting of Suffolk County; the changing patterns of agriculture in the county with a look at the present patterns of agriculture in the county; and a thorough explanation of the problem existing in the county in 1973, that being the encroachment of urban development. The report concludes with a discussion of several implementation strategies of agricultural retention methods.

246. Klein, John V. N. 1974. *Report to the Suffolk County Legislature from the Select Committee on the Acquisition of Farmlands.* Hauppauge, NY: Farmlands Preservation Program. 35 pp.

This report is a summary of the findings and recommendations of the Select Committee on Farmland Acquisitions, a result of three meetings on the acquisition of development rights for Suffolk County, New York.

247. Reganold, John P. and Michael J. Singer. 1977. *Defining Prime Agricultural Land in California.* Davis, CA: University of California Environmental Quality Series. No. 29. 45 pp.

This report discusses the issues of urban encroachment on prime agricultural land in California. The report illuminates the need for farmland retention in California. An extensive review of alternatives for preserving farmland, methods for identifying those lands to preserve, and a discussion of implementation possibilities are included. The methods reviewed for defining prime agricultural lands are the USDA Capability Classification System and Land Inventory and Monitoring System, the Storie Index Rating, Black Hawk County's Corn Suitability Rating System, Canada's Land Capability System, California's legislative definitions, and those methods employed in Tulare County and the City of Visalia.

248. Reganold, John P. and Michael J. Singer. 1979. "Defining Prime Farmland by Three Land Classification Systems," *Journal of Soil and Water Conservation*, Vol. 34, No. 4 (July/August): 172-176.

Using soils data from Yolo County, California, the authors compared quantitatively, the Storie Index Rating, the U.S. Department of Agriculture's Land Capability Classification System, and the U.S. Department of Agriculture's Land Inventory and Monitoring system to illustrate how different soil series are classified by each system and how many acres of prime and nonprime farmland are included in each region.

249. Sanger, John M. Associates, Inc. 1978. *Economic Impacts of Agricultural Land Preservation in King County: Development Rights Purchase.* Seattle: King County Office of Agriculture (June). 122 pp.

This report, prepared for the King County Office of Agriculture, presents the economic impacts of the proposed King County Farmland Preservation Program, including impacts on the viability of agricultural operations, employment and income in the county associated with agriculture, price of land for agriculture and other uses, and costs of acquisition to the county. The study also looks at the program's effects on urban development patterns and public service costs to serve urban development.

250. Spellman, John D. 1976. *Remarks to the King County Council: Agricultural Land Retention Program.* Seattle: King County Council. 7 pp.

This report discusses the questions posed to the King County Council from those groups and citizens interviewed regarding the county's Farmland Retention Program including answers as presented by the Council to each of the questions.

251. Soil Conservation Society of America. 1976. *Retention of Agricultural Land* (Series of articles). Ankeny, IA: Special Publication No. 19. 30 pp. *(see 193)*

252. Steiner, Frederick and John Theilacker. 1979. "Locating Feasible Areas for Rural Housing in Whitman County, Washington," *Journal of Soil and Water Conservation*, Vol. 34, No. 6 (November/December): 283-285.

This article is a review of a natural resource inventory and rural housing feasibility study conducted in Whitman County, Washington. This study was an effort to identify lands feasible for rural housing in a county where the preservation of the agricultural economy is the primary goal. The study was conducted in concurrence with the newly adopted guidelines for rural home site selection as adopted in the 1978 county comprehensive plan.

253. Toner, William. 1978. *Saving Farms and Farmlands: A Community Guide.* Chicago, IL: American Planning Association (formerly the American Society of Planning Officials). Report No. 333. 45 pp. *(see 194)*

254. Walworth County Agricultural Committee. 1978. *Walworth County Agricultural Preservation Plan.* Elkhorn, WI: Walworth County Park and Planning Commission. 47 pp.

This report is a result of an extensive planning project on which Walworth County officials and citizens worked together to insure the economic livelihood of their county by preserving county farmlands and environmental resources. The report presents the goals and objectives formed by the agriculture committee, a resource inventory, and the agriculture preservation plan analysis, adoption and implementation. The

report was developed to accentuate the goals and objectives as presented in the adopted county comprehensive plan, promoting economic growth in existing growth centers.

255. Whitman County Regional Planning Council. 1978. *Whitman County Comprehensive Plan.* Colfax, WA. 64 pp.

The comprehensive plan lists the goals and objectives as developed by the citizens of Whitman County. This plan is important because of its dedication to the preservation of agricultural land and the family farm as the prime economic and social resources of Whitman County.

256. York County Planning Commission. 1975. *Agricultural Land Preservation: A Topical Study for York County, Pennsylvania.* York, PA (June). 99 pp.

This report explores the concept of agricultural land preservation and reviews the agricultural land needs of the world, the United States, Pennsylvania and specifically, York County. Discussion of the methods of preservation is focused on two areas: physical or conservation techniques; and theoretical or legal techniques. Goals and recommendations for action towards preservation of the agricultural lands of York County are presented.

257. Yakima County Planning Department. 1978. *Rural Land Use Planning for Yakima County.* Yakima, WA (October). 63 pp. (7 sections).

This information packet on rural land-use planning for Yakima County, Washington covers methods of guiding rural land-use issues in Yakima County, the citizen's role in preparing rural land-use guidelines, the comprehensive plan, subarea plans, subdivision regulations, and the county zoning ordinance. The Yakima County plan has as one of its goals, the maintenance of the rural character of the area by assuring a compatible mixture of agricultural and rural residential uses.

Methods for Farmlands Preservation

258. Agricultural Preservation Task Force. 1979. *A Deed Restriction Program to Preserve Farmland in Lancaster County, Pennsylvania.* Lancaster, PA: Lancaster County Planning Commission (February). 31 pp. *(see 224)*

259. Bare, B. Bruce, Lloyd Skinner, K. P. Rustagi and Gerald Schreuder. 1978. *A Citizens' Guide to Using the Input-Output Multipliers.* Seattle: University of Washington, College of Forest Resources (June). 19 pp. *(see 225)*

260. Barron, James C. 1975. *Transferable Development Rights.* Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service, EM 3939 (April). 7 pp.

This publication presents a detailed example complete with illustrations of a transferable developments scheme.

261. Barron, James C. and Bruce Florea. 1973. *Open Space Taxation: Guidelines for Assessing Open Space Property Values.* Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service, EM 3426 (Rev.). 19 pp.

This circular discusses the use of the Open Space Taxation program for assessing the true and fair value of farm or open space lands in the state of Washington. The major issue discussed is how to determine the value of land by using land classification systems (i.e. Land Capability Classification System, SCS-USDA). The second issue discussed is methods for determining the net income of the classified groups along with an estimation of the land value by capitalizing income.

262. Beldon, Joe, Gibby Edwards, Cynthia Guyer, Lee Webb (eds.). No date. *New Directions in Farm, Land and Food Policies: A Time for State and Local Action.* Washington, D.C.: Agriculture Project, Conference on Alternative State and Local Policies. 319 pp. *(see 181)*

263. Block, William J. 1969. *Rural Zoning; People, Property and Public Policy.* Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service, EB 600 (November). 32 pp.

This circular explains the differences between (urban) metropolitan and nonmetropolitan (rural) zoning. The potential and limitations are presented as well as public misconceptions and misunderstandings about rural zoning. Also discussed in this report are the zoning incentives (suburban growth, highways, infringements) and techniques and processes to bring about effective zoning plans.

264. Boyce, David E., Janet Kohlhase and Thomas Plaut. 1978. *The Development of a Planning-Oriented Method for Estimating the Value of Development Easements on Agricultural Land.* Philadelphia: Regional Science Research Institute. 54 pp.

This paper presents a method that can be used to estimate the value of development easements on agricultural land for general planning purposes. The paper discusses a method for estimating market value of land, then addresses the problem of estimating agricultural use values, and concludes by combining these two sets of estimates to determine the value of development easements.

265. Bureau of Environmental Planning. 1978. *Exploring the Use of TDR in Pennsylvania: Conference Proceedings.* Harrisburg, PA: Department of Environmental Resources, Division of Planning Assistance (March). 102 pp. *(see 228)*

266. Chelan County Planning Department. 1977. *Techniques for Agricultural Land Use Conservation: An Evaluation of Alternatives.* Wenatchee, WA: (June). 50 pp.

Because of Chelan County's interest in agricultural preservation, the county planning department has assembled this information report for review by the county residents and local administrators. Methods for agricultural land preservation that are reviewed in this report are zoning, agricultural districts, agricultural easement purchase, transfer of develop-

ment rights, transfer fee plan, land value adjustment, property tax reform, transfer tax, and planned public facilities expansion.

267. Conklin, Howard E. 1976. *Property Tax Incentives to Preserve Farming in Areas of Urban-Pressure.* Ithaca, NY: Cornell University Department of Agricultural Economics, No. 76-2 (January). 18 pp. *(see 234)*

268. Conklin, Howard E. and William R. Bryant. 1974. *Agricultural Districts: A Compromise Approach to Agricultural Preservation.* Ithaca, NY: Cornell University, Department of Agricultural Economics, No. 74-22 (September). 7 pp. *(see 211)*

269. Foster, Phillips, Frank Schnidman and Mark Bailey. 1974. *Transferable Development Rights: Are They a Step in the Direction of Better Land Use Management?* College Park, MD: University of Maryland, Cooperative Extension Service, Extension Bulletin 251. 8 pp.

This circular addresses several faults and inadequacies of zoning, the advantages of developing a modern, long-range, comprehensive master plan, and a detailed review of a Transferable Development Rights (TDR). A simple illustrated example of a TDR process is included.

270. Gale, Dennis E. and Yarvey Yampolsky. 1975. "Agri-Zoning, How They're Gonna Keep'em Down on the Farm," *Planning* (October). *(see 236)*

271. Gray, William H. 1975. *Methods of Agricultural Land Preservation.* Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service, EM 3906 (February). 8 pp.

This circular reviews several methods for retaining productive agricultural lands including property taxation programs and agricultural and flood plain regulations. The circular includes a matrixed comparison of policy tools designed to preserve agricultural land.

272. Herr, Philip B. and Associates. 1972. *Performance Zoning II.* Greenfield, MA: Franklin County(June, revised July, 1978). 47 pp. *(see 237)*

273. Isberg, Gunner. 1973. "Controlling Growth in the Urban Fringe," *Journal of Soil and Water Conservation*, Vol. 28, No. 4 (July/August): 155-161. *(see 189)*

274. Metropolitan Council. 1976. *Agricultural Planning Handbook: Identifying Long Term Productive Farmland.* St. Paul, MN. 47 pp.

Serving as a handbook for identifying long-term productive farmland, this report is divided into six separate studies. These studies include: examining the present character of farming activities in the local area; identifying productive soils; agrivestment (investment in buildings and other real property improvements); existing urban development; government plans for new facilities; parcel size and ownership patterns—completing these six studies, as suggested by the authors, will enable the investigator to interpret the potential for long-term agricultural use of the land. These studies are also useful when designing long-term, short-term marginal and unique farmlands.

275. Preble County Cooperative Extension Service. 1973. *Proceedings of Preble County Rural Zoning Seminar: February 23-24, 1973.* Dayton, OH: Miami Valley Regional Planning Commission. 68 pp.

This publication is comprised of the seminar presentations of the Preble County, Ohio Rural Zoning Seminar. The zoning workshop was conceived to provide a means of training for public officials and others who have a direct input into zoning. Major topics covered at the seminar were the relationship of zoning to planning, duties and functions of the zoning commission, board of zoning appeals, zoning inspectors, and interests of Preble County.

276. Reganold, John P. and Michael J. Siner. 1977. *Defining Prime Agricultural Land in California.* Davis, CA: University of California, Davis. Environmental Quality Series No. 29. 45 pp. *(see 247)*

277. Snyder, Robert W. 1972. *You and Rural Zoning: Part I.* St. Paul, MN: University of Minnesota, Agricultural Extension Service. Extension Bulletin 373. 24 pp.

This report presents many of the fundamentals of rural zoning, explains what it can and cannot be expected to accomplish, and lists several of the common fallacies that confuse the issue.

278. Soil Conservation Society of America. 1976. *Retention of Agricultural Land.* Ankeny, IA: Special Publication No. 19. 30 pp. *(see 193)*

279. Stockham, John and James R. Pease. 1974. *Performance Standards . . . A Technique for Controlling Land Use.* Corvallis, OR: Oregon State University Extension Service, Special Report 424 (November). 50 pp.

This report examines various land-use control techniques available to the planner as supplements or alternatives to zoning for implementing plans. Emphasis is on the performance standard employed as a tool for determining proper land-use decisions. Case studies of performance zoning experience of Franklin County, Massachusetts; Gay Head, Massachusetts; Knoxville, Tennessee; Chicago, Illinois; New York, New York; and Duxbury, Massachusetts.

280. Toner, William. 1978. *Saving Farms and Farmlands: A Community Guide.* Chicago, IL: American Planning Association (formerly the American Society of Planning Officials). Report No. 33. 45 pp. *(see 194)*

281. U.S. Department of Commerce. 1975. *Zoning for Small Towns and Rural Counties.* Washington, D.C.: Economic Development Administration. 96 pp.

This report for county and local administrators, planners and officials discusses community development problems and how they may be solved through zoning. The report, presented in a "handbook" format, includes a section on agricultural zoning.

282. Washborn, Wallace E. 1976. "A New Way to Place Money Back into our Farmlands," *Planning* (November): 25-27.

This article discusses the agricultural land preservation method, Transfer Fee Plan (TFP) for discouraging the conversion of reserve land to a

non-farm use. This approach proposes the creation of prime farmland reserves in counties with commercial food or fiber production, provisions for jurisdiction over the reserves by county prime land preservation boards and distribution of penalty payments to those landowners in the TFP program as compensation for lost development rights.

Miscellaneous Farmlands Preservation Resources

283. Barron, James C. 1972. *Economics of Environmental Management.* Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service, EM 3654 (October). 24 pp.

This publication describes the conceptual framework of economics as it relates to environmental management. The basic tool kit of the economist is inventoried in a simplistic manner and applications are made to environmental issues. A list of references for empirical information on specific effects and control systems is provided.

284. Bosselman, Fred, David Callies, John Banta. 1973. *The Taking Issue: An Analysis of the Constitutional Limits of Land Use Control.* Washington, D.C.: Council on Environmental Quality. 329 pp. *(see 145)*

285. Lassey, William R. 1977. *Planning in Rural Environments.* New York: McGraw-Hill, Inc. 157 pp.

This book describes the issues and elements with which rural planners must deal. Methods and procedures for improving the rural planning process are discussed, including strategies for the improvement of human services in rural regions. Planning concepts and methods are illustrated through a series of case examples, and diagrams are used to integrate the key issues and variables discussed in each chapter. The text concludes with a critical discussion of education for planning and presents an adapted organizational structure for rural regions to support improved planning mechanisms and processes.

286. Carlson, John E., Maurice McLeod, William R. Lassey, Don Dillman. 1977. *The Farmer, Absentee Landowners and Erosion: Factors Influencing the Use of Control Practices.* Moscow, ID: University of Idaho, Idaho Water Resources Research Institute (December). 38 pp.

This study analyzes the attitudes and behavior of farmers and absentee landowners in the Palouse region of eastern Washington and northern Idaho concerning the adoption or failure to adopt erosion control practices. It is helpful in that it helps to gain an insight into farmers' attitudes about planning.

287. Hagman, Donald G. and Dean J. Misczynski. No date. *Windfalls for Wipeouts: Land Value Capture and Compensation.* Chicago: The American Planning Association. 660 pp.

This paper discusses the benefits (windfalls) and losses (wipeouts) to land and real estate that often results from governmental projects and regulations with a discussion of wipeout mitigation techniques including planning and regulatory acquisitions, and compensatory regulations. The report discusses windfall recapture techniques including special assessments, sale of development permission, land value taxation and several others.

288. Meyers, Peter. 1979. "Land Rush: A Survey of America's Land, Who Owns It—Who Controls It, How Much is Left," *Harpers* (January).

This report is a very thorough review of America's land, through ownership, including private, federal, state, local and Indian trust land, who profits from the harvest, the price of the land and the changes in major uses of land. A review of land legislation and a presentation of land rush examples concludes this well-researched article. Complete with charts, tables and illustrations, the article is useful to those interested in the issue of land use.

289. Moss, Elaine (ed.). 1977. *Land Use Controls in the United States (A Handbook on the Legal Rights of Citizens by the Natural Resources Defense Council.).* New York: The Dial Press/James Wade. 362 pp.

This excellent book reviews federal, state and local laws dealing with land-use issues. Included are discussions on basic constitutional issues, the National Environmental Policy Act, the Clean Air Act, the Federal Water Pollution Control Act, the Coastal Zone Management Act, the National Flood Insurance Program, the Wild and Scenic Rivers Act, consumer and investor protection, transportation facilities, public lands, and state, local, and regional land use controls. Many of these topic areas are relevant to agricultural preservation.

290. Schnepf, Max (ed.). 1979. *Farmland, Food and the Future.* Ankeny, Iowa: Soil Conservation Society of America. 214 pp. Library of Congress Catalog Card Number 79-5490.

This book presents a comprehensive review of the issue of farmland protection. The contributors include some of the most knowledgable individuals concerned with this issue. It is basic reading for anyone with an interest in farmland protection.

291. Steiner, Frederick and John Theilacker (eds.). 1980. *Farmlands Preservation—The State of the Art* (Proceedings of a conference held November 12-14, 1979 at Washington State University, Pullman, Washington). Pullman, WA: Cooperative Extension Service. 167 pp.

This collection of conference papers concentrates on approaches for the protection of farmland. Local, state, and federal programs are included. There are also interesting papers on public awareness in land-use issues, the legal aspects of agland preservation, and energy-efficient small family farms.

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